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ARMED FORCES management

PUBLISHED FOR THE MILITARY SERVICES OF THE FREE WORLD

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Gen. *Westmoreland of the 101st . . .*

Management Analysis:
Not a Comptroller's Toy . . . 16

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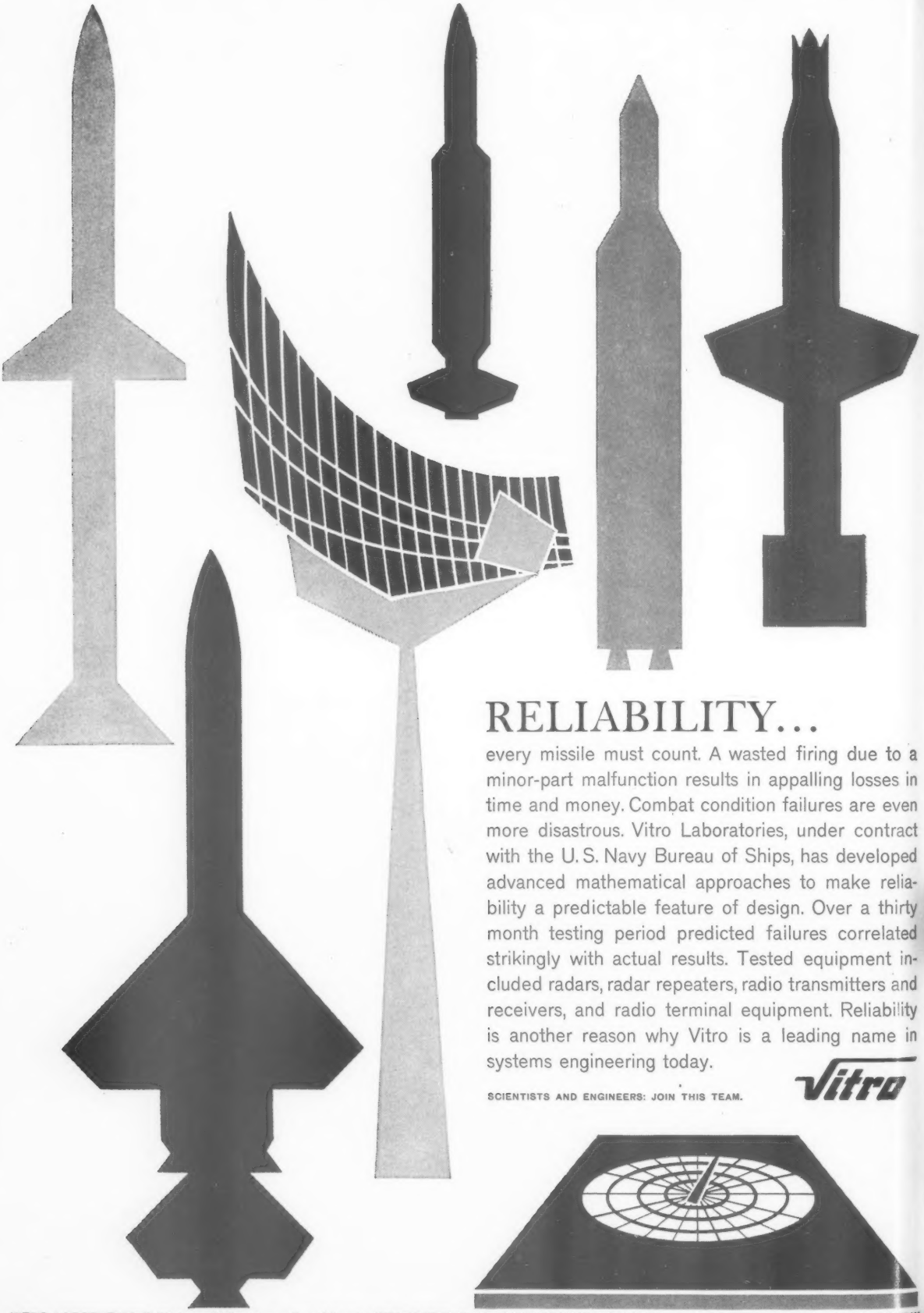

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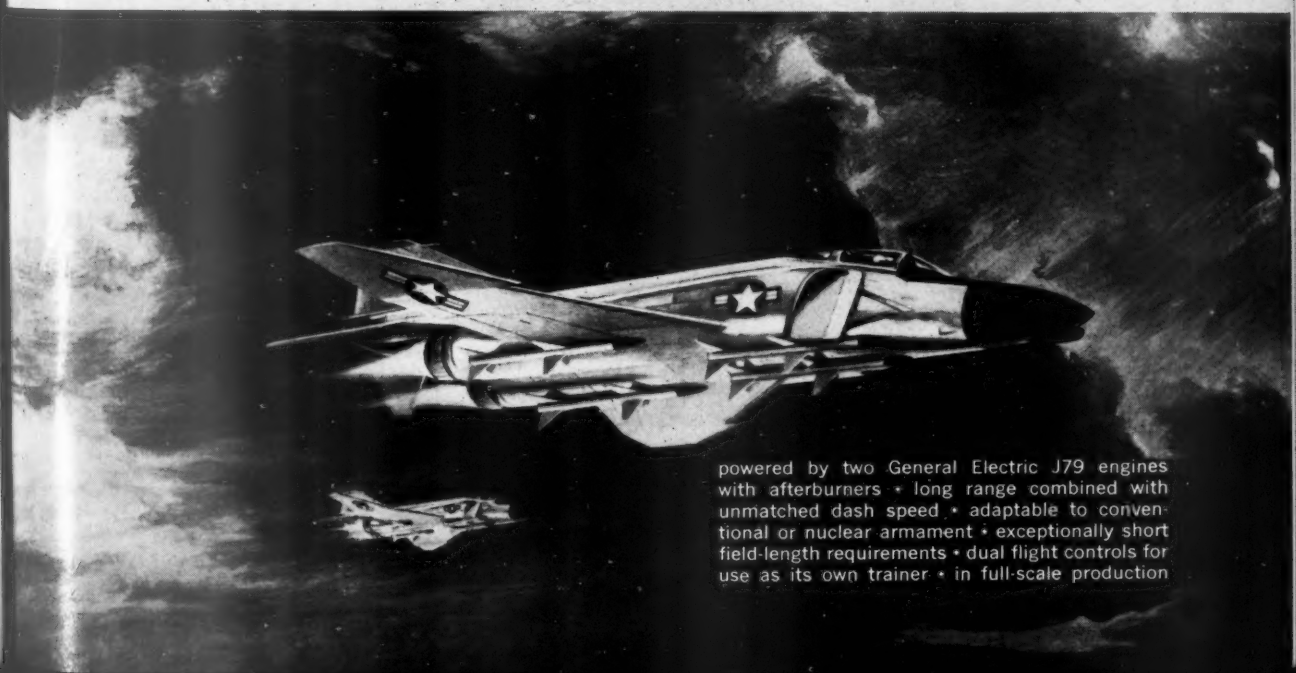

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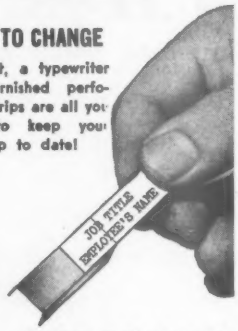

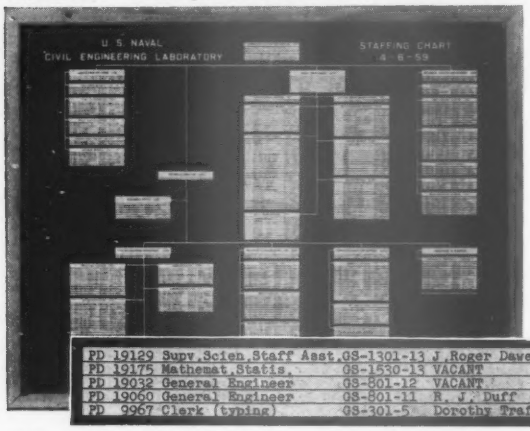

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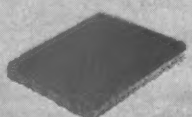

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ARMED FORCES management

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FEATURES

Management Analysis: Not the Comptroller's Toy 16

A major reason that the Army's 101st Airborne Division is ready to go at all times, says former commander Westmoreland, is that it recognized the need to "back STRAC." Although primarily a combat commander, Westmoreland realized that his responsibilities included good management.

(Cover: U. S. Army Photo)

ICBM Site Activation: Why the Betting is on People 18

Concurrency, a necessary concept, is also a gamble—a gamble in an entirely new field from a weapons development standpoint. Learning the "game" has meant errors but Army and Air Force are betting on people to correct the mistakes, take up the slack in site activation that these errors have left. This is the background . . .

Defense Supply Management: Where Do We Go From Here? 21

The Armed Forces Supply Support Center is due to release a key document late this year on a major military procurement field. How they are going about reaching their conclusions gives a marked insight into why, in the Defense "buying business," they are the major influence they are . . .

New Look in Navy Research 26

Conclusion in a two-part series on how Navy is adjusting the procedures in its research and development business to take full advantage of modern science's major technological breakthroughs.

How to Put Muscle in Cost Improvement 34

G. H. Jacobsen, cost improvement specialist at General Electric's Missile and Space Vehicle department, outlines some of the philosophy that has led to such program-by-program savings to the government and the taxpayer as $480 thousand on re-entry vehicle transportation.

Pentagon Profile—This Month: Hugh Milton II 39

"It has become a matter of fighting with resources rather than guns (which means) a heavier emphasis on good management."

The Eighth of Fourteen Erroneous Postulates 51

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FEATURED NEXT MONTH

Has Defense Failed its Mission? . . . Exclusive interview with Deputy Defense Secretary Douglas: "We really get no alternatives." . . . How to Lick your Paperwork Problem.

Nuclear claws for a new breed

of Falcons

The Hughes Falcon GAR-11 is the first air-to-air guided missile to pack a nuclear punch.

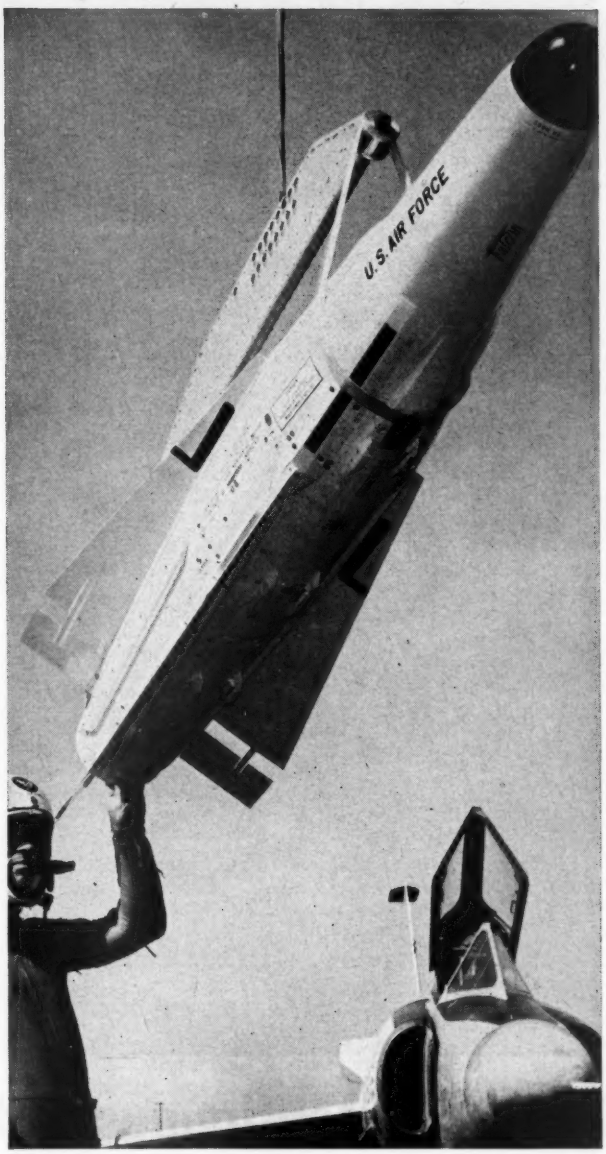
Developed by Hughes, the "Nuclear Falcon" adds a major new weapon capability to our defense arsenal. A weapon that can down *any* bomber in the skies.

Because of its heavy blast intensity and high degree of accuracy, the "Nuclear Falcon" is particularly effective in high-speed closures against bombers carrying the deadliest of weapons.

The Falcon family has proven itself in operational service—every modern U.S. all-weather interceptor carries Falcon missiles. In simulated tactical firings Falcons have achieved unexcelled records for accuracy and reliability.

Like other Hughes weapons, systems and components, the Falcon is a product of Hughes' unique capabilities in virtually every area of advanced electronics. These include projects in space systems, airborne control systems, microwave communications, data processing and display systems, ASW systems, radar and IR detection systems—and many others.

These advancements in the state of the electronic art are based on foresight, imagination, and proven management capability. Their reliability and operational capabilities have earned them the confidence of users throughout the free world.



Larger than earlier Falcons, *yet small considering its nuclear capability, the GAR-11 is 7 feet long, 11 inches in diameter and weighs slightly more than 200 pounds.*

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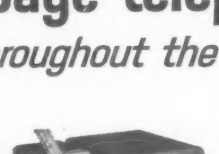
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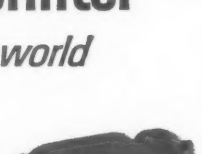
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Among Rational Nations . . .

IT IS PATENTLY obvious to just about anybody with the price of a morning newspaper that the Free World is in for a rough Red time of it in the next few months.

Communist probing for weaknesses on our side of the iron fence has stepped up its tempo. While their basic aim is indeed to *find* a soft spot, their hostile rocket rattlings invariably provide a secondary reward —setting the body politic of democracy trembling.

The most frequently voiced answer, when our leaders are hit by one of these hot blasts from the cold war, is, in effect, "Now, gentlemen, don't be that way. We are all rational nations and we all know war between H-powers will be fruitless. For the first time in history, we *must* develop machinery other than total war to resolve international conflicts."

A fine ideal, and few people would argue with such an admirable philosophy. But the communists, by their actions, have obviously learned something else—and learned it far better than we. To quote a Navy commander: "The balance of power will gradually shift toward nations that are more willing to risk their own destruction for the sake of their objectives—unless, of course, they miscalculate."

OUR LEADERS, apprehensive of holocaust, seem bent on resolving the world's problems by creating an international debating society. But this is not a contest in oratory.

If anything, it is a two-handed poker game. And the communists habitually draw three cards and bet the size of the pot. Best we seem to be able to do is stand pat and check to the bettor.

Certainly, we do not propose that the Free World start taking the same sort of risks as the Russia-China bloc. But just as certainly we're not going to stop them from taking chances by indulging in peripatetic throne room palaver.

When this nation was still a young, tow-headed, scratchy-kneed boy we sent ships to the Barbary Coast, troops to China, cavalry to Cuba, muscle all over the world. We took "nothin' from nobody" and went to war over incidents which barely make front page news today.

At the present time, we are letting American aviators rot in Chinese jails, shudder each time an American transport plane is shot down off Korea, severely criticize a Secretary of State for practicing "brinkmanship."

(The pathetically laughable thing about that last is that Nikita Khruschchev invented the game, taught John Foster Dulles how to play it, and is still the best practitioner in the field.)

If we are ever going to win this cold war—or at least resolve it—we've got to take the guesswork out of the game. We must quit playing bad poker and generate more powerful international doctrine—where each aggression will be rewarded with a punishment, clearly so stated in advance. If we set the price tag high enough, our enemy becomes predictable. The cold war will cease to simmer on the back burner as it now threatens to do for the rest of mankind's natural life.

WE CAN TAKE the initiative in this business. We need not act defensively in every situation possibly leading to war just because we are not going to fire the first shot.

To quote another military man, "the strongest possible program is indicated—to educate Americans to the necessity of backing our leaders in bold and unconventional decisions. We must grasp the fact that important issues are always controversial and that our recent inability to take the initiative constitutes a serious weakness in our military posture."

From a small, spot-check poll among American citizens recently, we have concluded that most people would much prefer we went back to Teddy Roosevelt's philosophy, speaking softly and carrying a big stick.

Our behavior in the past year has been quite the opposite: yapping in a stentorian voice and hiding the stick behind our backs. (Significantly, in the two recent times when we have gotten our dander up and swung the club in the open, the communists have quickly and perfunctorily backed down.)

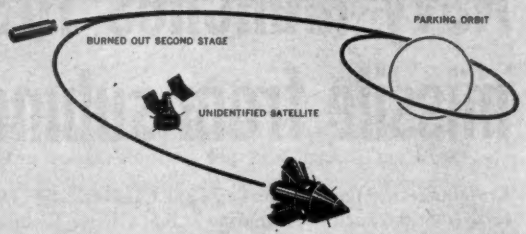
For a variety of reasons including fear of retaliation, there is today a reasonable doubt developing as to just how serious we are about ever using this massive strength we pay so awesomely to maintain. We are afflicted with mushroom clouds on the brain, a fatal disease for any nation wearing the mantle of world leadership.

Bill Borklund

New Subtitle Noted

Armed Forces Management has revamped its magazine subtitle to read "Published for the military services of the free world." The improvement in the magazine's masthead is a more accurate reflection of the magazine's expanded military readership. Egged on by heightened world tensions, and a concurrent increase in the value of the magazine's contents to key military decision makers, we are adjusting to a major international security philosophy which both this magazine and the Defense Department are, in fact, following more vigorously than ever.

NEW ERA OF WESTERN DEFENSE



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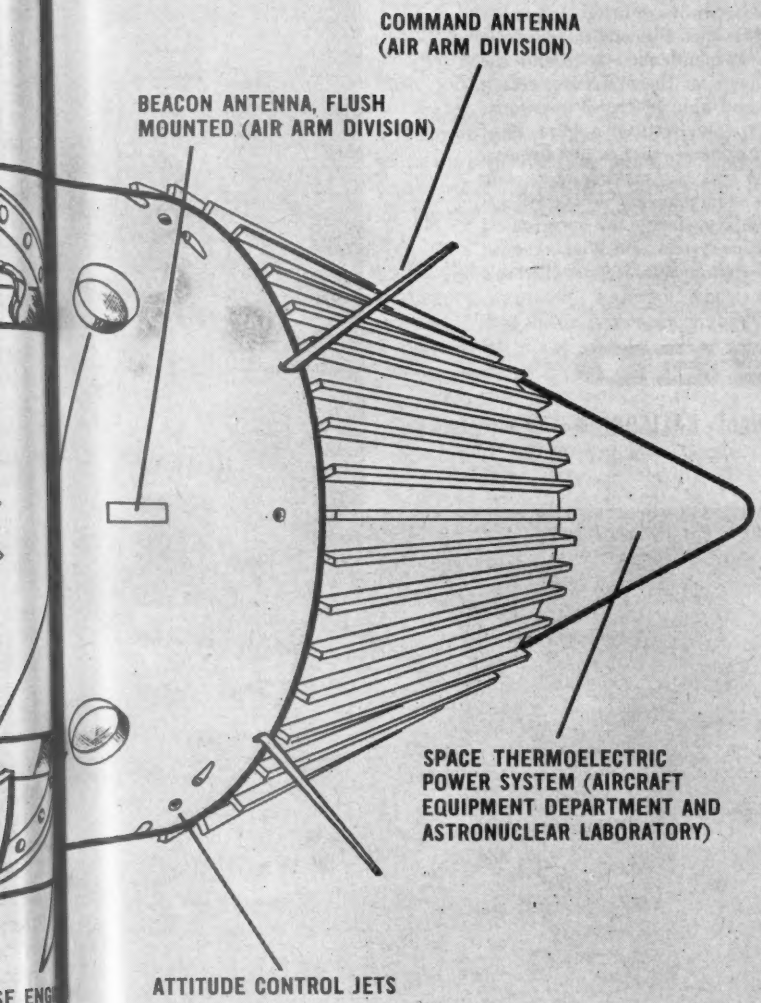
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This payload, one of the many space mission requirements, demonstrates a capacity approached by few companies today. Westinghouse provides the full range of experience, facilities and engineering skill needed to produce pay-loads vital to the nation's space program. *You can be sure . . . if it's Westinghouse.*

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NEW ERA OF WESTERN DEFENSE

Navy launches first Polaris missile from submerged sub

Erupting from Atlantic waters off Cape Canaveral July 20, a slim white Polaris missile fired from the nuclear submarine U.S.S. George Washington launched a new era of defense. Arching skyward on a column of flame, the Polaris made its clear contribution to the security of free nations before it shook off its last drops of brine. To further demonstrate the missile's dependability, the Navy then launched a second Polaris from the nuclear sub. This was the climax of a remarkable 47-month race to develop the Navy's Fleet Ballistic Missile Weapon System. Combined for the first time were a nuclear-powered submarine, hidden in ocean depths and able to cruise anywhere, unseen for months, and a powerful missile, so compact a single sub can carry 16 of them with nuclear warheads. The Polaris gives America a defense that cannot be overwhelmed by surprise attack, a defense that will work for peace by making aggression unthinkable. Lockheed is prime contractor and missile system manager for the Polaris missile. Aerojet-General Corporation is the subcontractor responsible for the missile's rocket motor, General Electric Corporation for its guidance system, and Westinghouse Electric Corporation for the launch system. The U.S.S. George Washington was built by the Electric Boat Company.

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AMC Work In ADP Has Promise

Separate data processing directorate set up by Air Materiel Command's General Anderson recently, has already begun to **tackle two big problems.** That AMC feels ready to tackle them at all is, in itself, **a significant commentary on how far ADP has come** in the Air Force.

First chore: tie together the massive development work carried on by the Air Materiel areas. Assigned bits and pieces of the total ADP plan a long time ago, AMA's have now pretty well completed their separate tasks. New directorate's basic job: pull them all together.

Second job: do the planning, set the requirements for the use of the new family of more powerful machines being developed by data processing equipment manufacturers. Part of the goal: expand present programs, where logical, to take advantage of the new equipment.

Sidelight problem: set up a system to communicate with the defense-wide single managers, more and more of whom are being set up in the supply area. Said one colonel, "this modern communication by ADP with single managers is becoming a real problem for all of us."

Minitrack Problem

Pentagon has long been the target of suggestions, criticism, advice and downright breast beating on how it can do its job better and what is wrong with national defense.

But the capper came one day last month in a call to one high level official. It should give all military managers pause.

Said the caller, **"you know what the real trouble is** with why we can't build a sound defense and why everybody in the world hates everybody else and why we are in such turmoil? **Well I do. The earth is out of orbit.** Can you do something about this?" Maybe we're working on the wrong problems?

Rome AMA To Shut Down?

Air staff is seriously **considering** (generally with favor) **closing** Air Materiel Command's **Rome Air Materiel Area** installation in New York, **transferring the work to Middletown.** Impending decision, if favorable, **may well mark a major Air Force trend in procurement and production.** Production problems are now handled by regional offices set up some time back. The three centers (Aeronautical Systems, Electronic Systems, Ballistic Missile) make major initial procurement on all major Air Force hardware. AMA's handle follow-on procurement.

If trend to AMA closing continues, centers may end up doing all procurement, initial and follow-on. Comments one Materiel officer, "Ogden, Sacramento, San Bernardino, Mobile are the only AMA's we really need. If we close the rest, we might have to add some people at the centers but I'd guess we could cut 75,000 people net off our payroll."

Spook In the E-ring

Ghost of the buried F-108 is coming back to mildly haunt Pentagon corridors as one off-shoot of Congressional funding boost for the B-70 revitalization.

Air Force will do little hard official pounding of the drums for the long range interceptor this year. But militarily, **the B-70 is only half an answer, and chances at the moment are "better than fair" that Air Force will try to get the F-108 back** into the budget next year.

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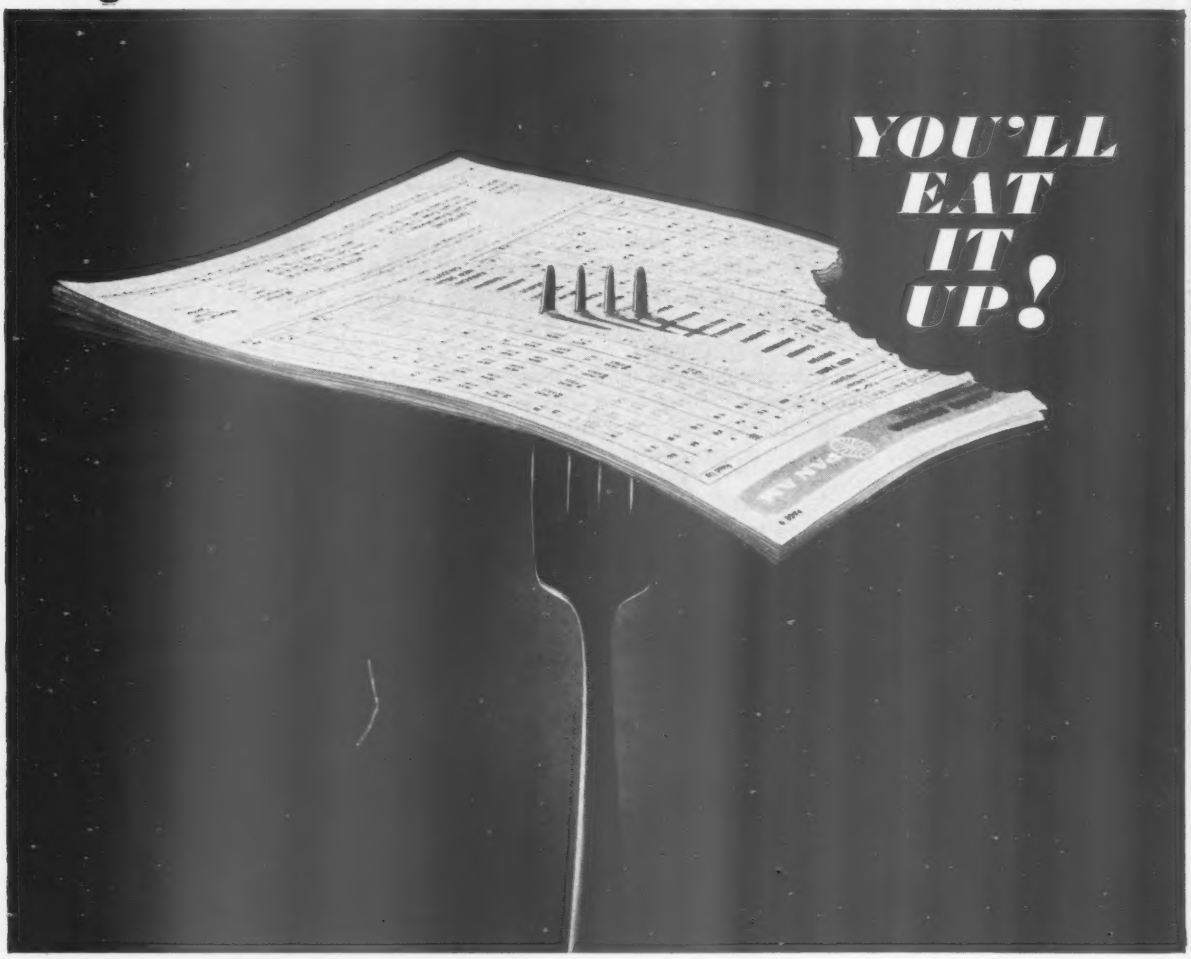

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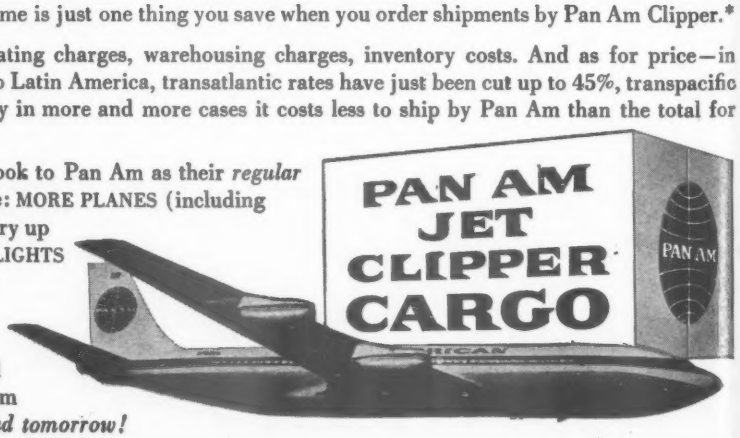

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Management Analysis: Not A Comptroller Toy

by Maj. Gen. W. C. Westmoreland

PART I

(U.S. Army Photo)

There is probably no military organization with a higher reputation for combat readiness than the famed 101st Airborne Division of Fort Campbell, Kentucky. But there is more to combat readiness than simply being ready to go. It is a matter of having preparations made beforehand, and of dozens of other seemingly minor points which fall more accurately under the title of management than combat readiness. A major reason that the 101st is ready to go at all times is that its past commander, Major Gen. W. C. Westmoreland, recognized the need to "Back STRAC." Primarily a combat commander, Westmoreland still realized his responsibilities included good management—in the business sense. This two part series tells why, at Fort Campbell, management analysis and improvement is not a comptroller's toy.

OPERATION OVERDRIVE is the right name for the recent and continuing management improvement program being carried on by the 101st Airborne Division:

As is true in your automobile, Overdrive provides extra mileage, extra speed and extra efficiency for the 101st Airborne Division.

What Overdrive aims to do and is doing is to enhance efficiency and economy of all operations, not only in the technical service or production field, but in the combat arms or troop field. In putting Overdrive on the road, the 101st wanted integrated effort by all on-post elements, directed to better combat readiness of the STRAC troop units at Fort Campbell.

This integrated effort takes in many areas. For instance, in both service and combat units, the officer/manager had a most onerous task in getting himself efficient management tools.

Without an industrial-type profit and loss statement, without criteria to price end products, controls became difficult and complex.

Our aim on one hand in Operation Overdrive was to give the Class I installation commander and his staff the techniques to manage effectively and efficiently; to devise managerial controls needed to run a highly diverse and complex operation; and controls as effective as those used in industry, but peculiar and particular to operations at hand.

Second, we aim to develop controls or media allowing the troop commander to correlate statistical information on his activities into a measurable index of unit performance, compared with other units.

The nine phases of Operation Overdrive aim at nine major objectives:

(1) Providing more defense per tax dollar.

(2) Getting better efficiency per tax dollar.

(3) Enhancing personnel motivation.

(4) Reconciling Army's Command Management System and practical results.

(5) Stopping manpower employment leaks.

(6) Creating dynamic horizontal controls.

(7) Building cost consciousness at all levels.

(8) Assuring accurate, efficient records.

(9) Producing better management tools.

The nine specific projects, and their areas of interest, are as follows:

Operation High Gear (Post Blue Collar Area), Project Self-Help (Troop Barrack Repair and Utilities), Project Home-Aid (Quarters Repair and Utilities), Project Pixie (Post Exchange Area), Project Chairborne (Post White Collar Area), Project Spark (Unit Materiel Maintenance), Project Hi-Fi (Troop Personnel and Finance Administration), Project Thrift (Supply and Mess), and Command Data (Troop Unit Performance).

Providing Support

Besides these major programs a number of "ancillary" programs were begun. Without degrading these in the least, they are ancillary only so far as they support Overdrive itself.

All ancillary programs are important; all are inter-related and have bearing on our mission. In content they run the gamut from the Training Program and military exercises, Command Information Program, Public Relations Program, to the Suggestion Program.

This makes Overdrive the catalyst. It is the agent to get everyone into the act, to find out where we are going and why. Supplementary and corollary programs are designed to support and enhance the whole.

As to specific programs, the first was Operation High Gear, begun in the post industrial operations area in March, 1959.

Why High Gear?

What High Gear was to do broke into four basic aims. First, it was to bridge the gap between Army's Command Management System and installation production efforts. Second, it aimed to break down traditionally strong vertical control by technical services, with an eye for positive and dynamic horizontal integration.

Third, it was to spot one of the greater weaknesses in Army's management of resources by emphasizing and improving manpower controls. Finally High Gear aimed to increase efficiency in the technical service support agencies with the aim of a substantial increase in production.

These goals had to be met in the face of decreased operating funds, reduced personnel ceilings and increased high priority support missions.

The question was how to solve these problems. In the time-honored military tradition, an estimate of the situation was made.

First consideration was the mission of the post—maintaining readiness in high priority units stationed there. Second spotted factors adversely affecting our readiness posture, basically two—funds and personnel. These problems resulted in a corollary objective: re-

Poster Promotion worked well

turning maximum troops from station support to tactical units.

Study of the situation showed three alternative courses of action: (1) Curtailing training; (2) Reducing station support; and (3) Focusing attention on the industrial area.

The first two were ruled out immediately because of priorities which post tactical units faced and needed support in.

The third area, with its large civilian work force and the greater part of the budget dollar, remained the only area where a solution could be found.

To find this solution, industry was asked to help us out with management consultants. General Electric, in particular, has been most helpful, as have Union Carbide, Bell Telephone, Goodyear, Frosty Morn and others.

People from these firms visited Fort Campbell and took a long hard look at our activities. One of their first comments: "Your shops are too clean."

Manpower was being wasted in housekeeping, to the detriment of production. And as industry had visited us, our own people often went to industrial activities to study and compare.

This led to High Gear. The goal: 10% increase in production, across-the-board. Kicked off by a letter from myself, the program was assigned to Assistant Chief of Staff (G-4), designated Director of Industrial Operations.

We decentralized authority and responsibility to supervisors and foremen, holding them strictly to account for their operations' efficiency. We held classes on work simplification, management, and supervisor training. Production charts setup weekly at foreman level are consolidated by activity and sent to the technical service concerned for analysis and review. Specific trends requiring attention are discussed with deputy post commander or the commanding general on a "by exception" basis.

Our gains are many and varied. For example, cross training has resulted in much greater flexibility. In the engineer section, maintenance teams visiting barracks, once consisted of a plumber, a carpenter and an electrician. Now, one person handles all three jobs. We have further extended cross-training to minor sheet metal work and domestic heating.

We now have one consolidated battery shop where four once existed. Other shops have been relocated for more efficient operation.

We did not overlook the individual worker. Stressing high morale, we asked for suggestions at all levels, all with one object in mind: to back STRAC.

Work measurements were developed and individual productivity is accurately measured, charted and analyzed. By matching activity peaks and valleys, in various areas we have, for instance, shifted the work force from quartermaster parachute maintenance to quartermaster clothing and equipment repair to help out in peak periods.

In its first year, Project High Gear has turned in an 18% increase in overall production—almost twice what we expected.

Closely allied to High Gear is Project Self-Help, to improve maintenance and repair problems in troop areas by using troop labor trained by the post exchange repair and utilities school.

These men perform all first echelon repair and maintenance in their units with minimum technical aid from the post engineer. Basic aim is to relieve post engineer of many minor jobs not requiring skilled repairmen. This permits civilian technicians to concentrate on major repairs.

Rotation for Self Help

Supply accounts have been set up to allow bulk issue of repair parts to major unit Repair and Utilities sections. Paperwork has been streamlined to avoid procurement delays on minor parts. In general, repair and utilities personnel average about 1.2 per company-size unit, depending on type and number of buildings occupied.

Personnel are rotated to repair and utilities work within major units so that no individual spends over six months in this work. Also, non-commissioned officers surplus in grade from the 937th Engineer Group have been sent to aid R & U personnel.

A weekly maintenance schedule is maintained, and on the date and time indicated for each unit, the Engineer Shop Foreman delivers materials, plus technical aid or advice.

Units have a Repairs, Maintenance and Operation Check List on status of work done or to be done. Weekly progress reports are made on work performed by troops.

On Self-Help, our goal has been to do 70% of all work orders. To date, we complete about 60% of these.

Generally the same is Project Home Aid, providing on-post families with what Self Help is to troop units. Home-Aid was dictated by drastic cuts in maintenance funds, even though the number of dependent quarters constantly grew.

The purpose is to save money by showing adult family members how best to operate, maintain, and accomplish minor home repairs on household appliances; how to make them last longer; and how to avoid mistakes that lead to costly repair work. To meet this goal, such techniques were used as classes for adult householders, maintenance instructions with each type of quarters, and prominently posted instructions on the do's and don'ts of home maintenance.

How Damage Dropped

A measure of the results: Since the course began, only one damaged refrigerator has been reported—and that from an occupant who hadn't attended the course. All in all, there has been a 50% reduction in damages to quarters appliances since the program began.

Fourth on our list of things to do was Project Pixie—a formal effort in the Post Exchange to provide better service to military personnel through better customer-employee relations, improved internal controls, inventory controls, and wide but selective procurement.

Project Pixie, in three time phases, dealt with such areas as eliminating excess equipment, management development programs, and review of organizational structure and personnel relations. Also, committees were named to investigate areas such as control of concessions, shoplifting, pilferage, merchandising stock unit control, and maintenance procedures.

With Phase I complete and Phase II well underway, results show 31 recommendations made, all evaluated and ready to be implemented, plus—perhaps more important—an increase of 300% in valid suggestions.

(continued next month)

This article condensed by Gen. Westmoreland from an address to Army Management School on April 20, 1960.

(Martin Co. Photo)

ICBM Site Activation and the "Concurrency" Gamble:

Why the Betting is On People

"The truth is we are probably all at fault—partly," said one Air Force general of the fall behind in missile site construction. A flurry of directives has gone out. There has been some reorganization. But the military is not betting on directives or new organization charts to bail them out. The emphasis is on people. Here is why . . .

by C. W. Borklund

ON 9 JULY MESSAGE AFCVC 68258 went out over the wires from Air Force Pentagon headquarters. The address: PERSONAL FOR GENERALS POWER, ANDERSON AND SCHRIEVER FROM GENERAL LEMAY. SUBJECT: BALLISTIC MISSILE SITE ACTIVATION.

The 3-page, 8-part message said, essentially, that on 11 July Air Materiel Command became completely responsible for management of site activation in all ballistic missile programs. (Excepted were near-operational sites at Vandenberg, Calif., the 564th and 565th squadrons at Warren, Wyo., and the 566th at Offutt, Neb.)

LeMay's punch line:

I WANT IT THOROUGHLY UNDERSTOOD THAT I HOLD EACH SITE COMMANDER PERSONALLY RESPONSIBLE FOR THE SUCCESSFUL ACTIVATION OF HIS SITE AND ITS TURNOVER TO SAC IN AN ACCEPTABLE OPERATIONAL CONDITION AT THE EARLIEST POSSIBLE DATE. THIS INCLUDES RESPONSIBILITY . . . FOR INSURING THAT CONSTRUCTION PROGRESSES SATISFACTORILY AND ON SCHEDULE.

On one hand, the message exposed a serious schedule lag for ICBM site construction and activation. On the other hand, it officially launched a priority drive to put site activation back in step with the "concurrency concept" timetable.

Concurrency (a concept which brought ARDC's chief Gen. Schriever to the attention of Air Force top management) is integral to another concept: Weapon Systems Development.

With missiles, concurrency simply means building launch sites, training personnel, developing the logistics backup and the missile itself all at the same or nearly the same time. The "old" procedure was step by step to develop the weapon, put it in the arsenal, train people to use it, and build the logistics support.

Concurrency is a gamble. It is a gamble the military must take to compress weapons development time enough to provide weapons when the fighting forces say they must have them, to keep continuing deterrent edge over any probable enemies.

But like a young man at his first horse race, Air Force is gambling in a field where they have never been before. And it just happened that for all their paper plans, line-of-balance charts, theoretical organizations and procedures, ICBM site activation just hasn't worked that way.

Said one three-star general, "the whole job turned out to be bigger, tougher, and more complicated than any of us had originally suspected."

All the highly publicized delays in site activation stem from this one factor.

"We were possibly two or three months tardy in recognizing it," said one colonel, "but this is really where the trouble began."

The result has been partial rewrite of the "concurrency" manual (chapters only in first draft anyway). But, more significantly, the answer has been emphasis on the calibre of the people taking the gamble.

Under original plans, Air Materiel Command was to take over site activation after the first launcher was installed and checked out. ARDC was to control missile development and site activation until then.

Now AMC is responsible for the first as well as the rest. Among the reasons:

(1) AMC is a business command. Site activation is primarily a production business problem—even though hardware is still in advanced development.

(2) Earlier-than-previously-planned AMC familiarity with the system is now necessary to gain experience for later support of the operational site maintenance, spares purchases, and the like. (Strategic Air Command provided a heavy push to get AMC in the picture earlier for this reason. SAC's rhetorical question to the Air Staff: If AMC doesn't, how can they give us the supply support, engineering know-how, etc., that we will need?)

(3) ARDC had not had the background and experience in the construction business, dealing with Army Corps of Engineers and contractors. Nor did Air Force really want them to get it. ARDC has high priority R&D projects to worry about, too often could not give construction transition "bugs" primary and proper attention.

When AMC heard it was going on the firing line ahead of schedule, rumors exploded all over AMC headquarters and at its Ballistic Missile Center on the West Coast.

"The concurrency concept had too much concurrency in it and we're back to a step-by-step approach."

"If the Air Force couldn't produce, Defense would find a service that could."

"ARDC has lost favor with the front office."

(Continued on p. 20)

The Problems

ALMOST as volatile as the solution, certainly just as fascinating to read, are the problems which created all this fuss. Like the tigers chasing each other around the palm tree in "Little Black Sambo," Air Force, Army, contractors and labor wig-wagged fingers at each other with a will, often seem to have spent as much time arguing over who was at fault as they did working on the missile sites.

It is probably fortunate for the Defense Department that the back fence gossips, who delight in such material, were too busy with national political conventions to notice all the dirty linen.

"The truth is," said one general officer, "we're probably all at fault partly." Some of the haggling, by area of primary interest:

Air Force

1—Marrying the concurrency concept with today's technological revolution is, said one colonel, "like playing with a can of worms." Air Force dare not freeze a missile design to that envisioned when the first concurrency timetables are drawn up for fear of freezing out technical breakthroughs.

Weapon system changes may count up to as many as 200 a year on a given project, range from minor ones to major alterations. While necessary, they wreak havoc with designs and schedules for missile site construction. (This is part of the gamble of concurrency: whether these necessary changes can be made without losing the time concurrency is supposed to pick up.)

2—SAC increased its demands on the missile (reaction time, reliability, etc.) to bring it up to a higher standard SAC felt would be demanded of it in operation. Thus, one officer contended, "it became impossible to do all we had to do within the time period originally specified. The schedule stayed the same but we were working with an entirely different beast."

3—There was no "operational suitability test facility" for the leading strategic squadrons at Warren and Offutt to pattern their procedures after. Thus, the first sites must perform on-site development and testing, to a large extent, to erase the installation-and-checkout-of-equipment bugs. (Cape Canaveral can do little more than test the bird itself in flight, not the peripheral equipment nor checkout equipment nor the soundness of the facilities involved in an operational site.) With experience, this problem will become less hectic.

4—For a variety of reasons, some of them noted below, Air Force had trouble spotting slippages or potential trouble spots, had even more difficulty fighting its way through channels to get the warning to the right spot.

Army

The chief problem, said a BMD commander, Brig. Gen. W. E. Leonard, was "the difficulty of doing a wartime task under peacetime conditions and authority."

Maj. Gen. W. K. Wilson, Jr., Deputy Chief of Engineers, told a group of contractors (in the Pentagon in mid-August for a pep talk from Defense Secretary Gates) that the ICBM program has given the Corps of Engineers "one of the most difficult challenges in its history." Response to the challenge came with a rush when it came. But the response was slow getting cranked up.

Authority for site construction was split among Army districts. The same contractor was frequently responsible to two different engineer offices as far apart as New York and Los Angeles. Control was tied together only in one spot: way back at the Army Engineer Headquarters in Washington, D.C.

Then, too, Army (says the Air Force) showed little imagination in letting contracts for construction, used the standard fixed price, advertised bid procedure. Time-consuming paperwork ballooned. Each time the specifications changed, it meant in effect, a new contract which had to be re-bid. Until these agreements were reached, work sagged.

If Army (says Air Force) had used a negotiated procedure with letter-of-intent changes for known, qualified contractors this stop-start work pattern could have been eliminated, construction could have proceeded while the cost of the change was negotiated.

Then too, advertised bid procedures lay few ground rules about contractor competence, require nothing more, essentially, than that the lowest price receive the award. Thus, as happened in Ogden, the presumed contractor was nothing more than a broker, actually subcontracted the work to several dozen other firms and collected a percentage. Army will modify this procedure, operate on fixed price contracts but accept bids only from "qualified contractors."

Contractors

Successful bidders for construction contracts sometimes underestimated the job, went in over their head, used inadequate materials, ran late.

Prime missile contractors, claims the Air Force, were spending too much time on hardware development, not enough on preparing missile bases.

But contractors had their complaints too: conflicting requirements coming from different offices, each having no authority to overrule the other. (However, some contractors took advantage of this, played one office against the other when they got an answer they didn't like.)

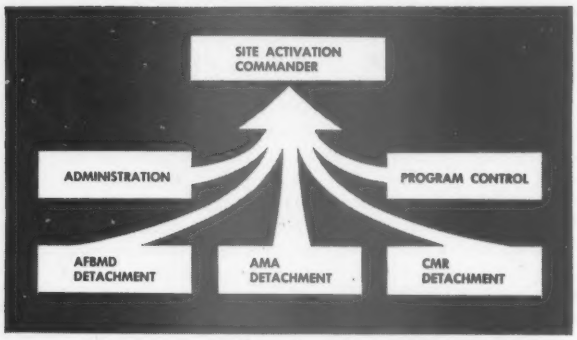
When timetables were thrown out of whack, they weren't notified in time. Contractors arrived on sites ready to go to work, found there was no room for them. They have complained, too, like Army, about the whole sets of changes which exploded each time some new discovery was made during a missile firing.

Labor

"If everyone else had been perfect," said one officer, "I guess you could say we had a labor problem." Helping keep the pace slow, labor unions squabbled with the military, with the contractors and among themselves. At Warren AFB in Cheyenne, Wyoming, alone, there have been 22 labor disputes in the past two years—including one squabble over who would carry a pipe its last 18 inches to a connection.

When contractors wanted to bring in their own workers rather than hire local union help, locals raised a fuss, generated more delays. In the first six months of 1960, jurisdictional disputes and strikes have cost the Atlas program alone 2,370 man-days.

Wrap-up: Essentially, there was in the whole site activation procedure a lack of central direction and authority.



Above: A graphic outline of the site activation commander's team. Briefly, AFBMD detachment, the ARDC contingent, will handle weapon configuration engineering, make sure the missile will fit when it arrives. Air Materiel Area group will provide supply, maintenance, production engineering, etc., support, build the experience necessary to back up SAC when sites become operational. Contract manager's group will survey contracts. Program Control will see that things stay on schedule, throw up a red flag for the site commander if a slippage is developing.

"Air Force would form its own construction team and deal direct with civilian contractors, by-passing Army Engineers."

Air Force top brass cut through the conversation, looked at the desk-high stack of real problems that created the headache. No single problem was devastating, but piled on top of each other they created a back-breaking burden.

Directives were issued, a lot of the usual organization was short-circuited and messages went out by the bucketfull. But primary emphasis was on people. In fact, organizational changes reflect this.

Air Force switched Maj. Gen. Thomas B. Gerrity from head of the Oklahoma City Air Materiel Area, "where he's done such a terrific job," to Englewood, Calif., to head AMC's Ballistic Missile Center. Air Force picked twelve senior colonels of top flight, general officer calibre to be site activation commanders.

Backing up LeMay's message, AMC headquarters left no doubt on how they felt about solving the activation lag. The word went out from AMC headquarters:

"We can issue all the directives we want, reorganize all over the park, but success or failure will depend on the people put in the organization chart boxes. We've tried to get the best we could find. If you (the site commander) can't get the solution to a problem, call Gerrity."

One of the most important results: The site commander becomes a project manager for the entire missile site activation project, can get to know such highly important but unpublicized aspects of site buildup as housing, labor and personnel.

Previously, planning or part of the job itself might have been done elsewhere and dropped in his lap. Now he must approve the site's installation plan, whether he draws it up himself or not. Once he approves, it becomes *his* plan.

He will be single contact point in Air Force for all problems in building the site. He will be on the carpet if construction and concurrent installation and equipment checkout falls behind schedule.

Before July, it was hard to find any one man responsible. Or so all the principles claimed. Contractors still maintain normal relationships with both Air Force and Army Engineers (who write and administer the construction contracts) but, on a sort of management-by-exception basis, the site commander is ultimately responsible.

Army moved fast, once Air Force decisions were made, to solve its part of the puzzle. In what Army Chief of Staff, Lemnitzer termed "a drastic change in Army organization," the Army Engineers Ballistic Missile Construction office was set up on the West Coast.

Boss of the outfit, Brig. Gen. A. C. Welling, will have a direct line to Lemnitzer through the Chief of Engineers, if he needs it. Office has nationwide authority to slice through traditional Engineer Corps geographic boundaries to get things done. (Previous inability to do this was a source of some of the trouble.)

Further, they went an Air Force recommendation one better, gave the on-site Engineer Corps representative direct access to Welling's office, by-passing the Engineer District Offices altogether.

A big factor as noted before, in the headaches Army and Air Force are now trying to cure has been the learning curve. Thus given normal progress alone, the situation will improve from here on out. "As was true in developing the missile itself," said one officer, "we had never really done this before and we were bound to make mistakes."

These mistakes are expensive: Atlas "soft" sites at Warren Air Force Base, Wyo., were originally priced at about $65 million, now may run as high as $100 million because of the delays and modifications.

In the future, Air Force expects launch sites will cost between $25 and $40 million, depending on configuration, i.e. soft or hard, coffin (horizontal) or silo, etc.

The new faces in charge intend to make the air more breathable, expect that the problems raised by contractors and operational people alike will get faster, more thorough attention. The goal: get back on schedule.

The People . . .

Not directives or reorganization but people will determine the success or failure of the rejuvenated missile site construction effort. These are the captains of the team:

Maj. Gen. T. P. Gerrity
Cmdr., AMC's Ballistic Missiles Center

Brig. Gen. A. C. Welling
Cmdr., USA/C of E Ballistic Missile Construction Office

Col. L. J. Anderson (USAF)
DCS/Hq., Air Materiel Command
(Liaison between AMC Commander, Gen. S. E. Anderson, and Gerrity)

In what Gen. Anderson terms, "accordance with AMC's modern management procedures" the test site commanders have been helped along by an 8-day highly concentrated school indoctrination into the complicated mechanics of missile site construction. They and missile sites involved are:

Atlas

Fairchild AFB, Wash.—**Col. Thomas S. Jeffrey, Jr.**; Walker AFB, N.M.—**Col. Robert I. Barrowclough**; Forbes AFB, Kan.—**Col. William E. Ruark**; Schilling AFB, Kan.—**Col. Arthur W. Cruickshank**; Altus AFB, Okla.—**Col. Ernest L. Ramme**; Dyess AFB, Tex.—**Col. Hugh H. Manson**; Plattsburg AFB, N.Y.—**Col. Calvin W. Fite**;

Titan

Larson AFB, Wash.—**Col. Edward J. York**; Beale AFB, Calif.—**Col. William E. Sault**; Ellsworth AFB, S.D.—**Col. Kenneth W. Northamer**; Mountain Home AFB, Ida.—**Col. Harmon E. Burns**; Lowry AFB, Colo.—**Col. James H. Thompson**;

Defense Supply Management:

Where Do We Go from Here?

As part of its continuing job of improving military supply management, Armed Forces Supply Support Center is currently taking a long, hard look at electrical/electronic materiel management. Best guess on the result of the study: "we won't come up with a status quo report."

by Fred Hamlin

IN DECEMBER this year, what could be one of the most important documents in modern military supply management will be released by Armed Forces Supply Support Center.

What it will be: an exhaustive study of the present supply picture in electrical and electronic material. More significantly, the report will include AFSSC's recommendations for the future of this phase of military supply.

Covered in the study will be military equipment representing nearly one-third of the number of items in military inventories, items taking up over $1½-billion of total military procurement dollars, with an inventory of over $3-billion.

And in a major break from AFSSC's past work, the E&E study will move definitely away from the housekeeping end of military supply and into the material that is part of the actual military combat mission. (While the recently formed Construction and Automotive single managers also cross this line, they do so to a lesser degree.)

It is not yet possible to say what the study's outcome will be. But to quote one analyst working closely with the study, "We aren't far enough along to be specific. However, I can almost say that the facts do not lead to a straight *status quo* report."

Started in January this year, the AFSSC study is now entering a third phase of four. This phase will be concerned with joint military agencies in the E&E area. Fourth phase will pull together data gathered during the year, analyze it, and come up with recommendations. The first two parts of the study dealt with E&E in the separate military services.

AFSSC isn't trying to come up with reasons for ramming through a new single manager. What they are looking for is the best possible way to handle this particular range of material. If a single manager is the answer, AFSSC will recommend it. And if it isn't, they won't.

The four services now handle electronics/electrical material on a vertical basis, with each filling primarily its own needs.

In this context, Col. J. R. De Luca, Chief of the AFSSC Analysis Staff points out that "we aren't necessarily looking for deficiencies in the vertical organization. What we are seeking to determine is if there are potential horizontal efficiencies across Defense management of E&E resources. I will be surprised if some of these don't evolve from our study."

"Any optimum course . . ."

Simply, AFSSC analysts are looking for a better way of doing business. Commodity Management Centers could be the answer, and Single Managership might work. But AFSSC is by no means committed to these answers.

In outlining study goals, one pertinent document phrases it this way: "Any optimum course of action that that may be . . . developed as a result of the study."

With this in mind, it is worth spotting a few trends in studies that AFSSC has produced in the past.

Presently, there are eight commodity single managers, in varying degrees of completion. They fall roughly in two groups.

First group includes the original single managers named: Medical, Subsistance, Clothing and POL. Set up in 1956 (prior to AFSSC's genesis), these four are the most clear and logical of the present single managers.

Each is relatively "pure"—food is food, whether it's caviar or corn flakes. And there are not as many technical problems with socks that there are, for example, in supplying the right electron tube for a given fire control system.

In none of these areas are item boundaries as complex—once the single manager was set up, he knew the main item range he was going to manage.

Beyond this, in all four areas—with the possible exception of POL—the choice of manager was obvious. Army had been handling many of these supplies for the Air Force right along, and with Navy cooperation, the packages were fairly simply wrapped up.

The second group of single managers came in the winter of 1959-60, and following AFSSC recommendations: General Supplies, Industrial Supplies, Construction Supplies and Automotive Supplies.

In recommending these, AFSSC branched away from the obvious and into the difficult. Where the first four designations were less complicated the next four were much more complex.

As a starting point, Army and Air Force didn't even have a common definition for General Supplies. Navy and Marine Corps had no such term in their vocabulary.

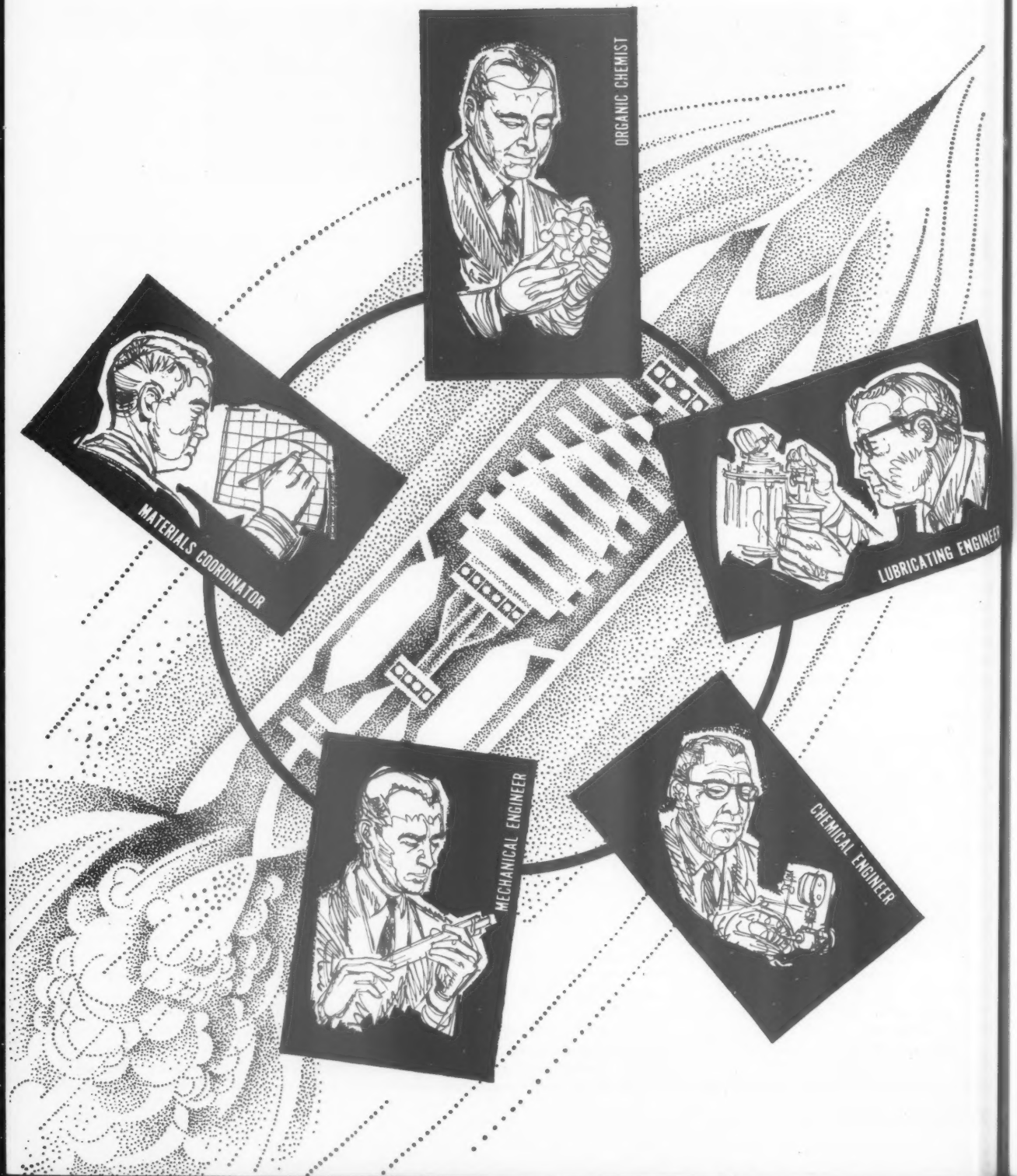
Another sign of diversification in setting up these managers was that they were left as "open end" operations. This meant that in February this year, AFSSC was back in the picture—to expand the General and Industrial Supply areas, adding sixteen new supply classes between the two.

Basically similar material was included under the clothing category.

Monsanto

Space-Age Project "HIGH-TEMP-LUBE"

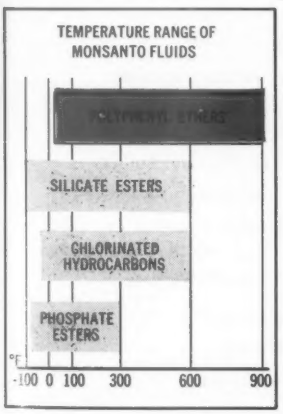
A CHEMICAL EXPEDITION..



.....seeking high-temperature lubricants for advanced jets and missiles...discovering new fluids that operate up to 900°F.

Monsanto has established a base of "know-how" in a new area of synthetic fluids: the polyphenyl ethers, fluids that exceed the high-temperature performance of all other known lubricants and hydraulic fluids. These newly synthesized liquids resist radiation damage, oxidation and chemical decomposition: as liquids they cover a temperature range of 20° F. to 900° F. Polyphenyl ethers are the result of creative chemistry applied to the problem of high-temperature lubricants; they were developed under contract and in cooperation with Wright Air Development Division, U. S. Air Force.

The heat stability of Monsanto's polyphenyl ethers is the result of enlisting chemical know-how on a problem of mechanical engineering. By design, lubricants for jet engines (and liquid fuel missiles) must lubricate and cool the bearings and accessory drive gears. Existing lubricants could not meet the requirements of advanced engine design. So the logical step was a Monsanto expedition into little-known fields of chemistry. A team of Monsanto scientists found and developed the polyphenyl ethers: to date, nineteen new compositions of matter.



In comparison with other synthetics, these lubricants are as thermally stable at 840° F., as are silicones and petroleum hydrocarbons at 740° F., and present commercial diesters at 540° F. Their useful temperature range exceeds all other fluids by 100° to 400° F.

Their chemical stability, physical properties, and lubricity recommend them for a host of other fluid applications: "hot" hydraulic systems; base stocks for high-temperature and/or radiation-resistant greases; and heat-transfer fluids.

Until development of the polyphenyl ethers, the calculated* useful life of the *best* synthetic lubricant was a scant 18 minutes at 900° F. Presently used synthetic lubricants would be effective for only 6 seconds to 3 minutes at this temperature. Polyphenyl ethers, however, would have useful lives of *20-80 hours* at 900° F.

*Based on the activation energy derived from isoteniscope data.

THERMAL STABILITY OF POLYPHENYL ETHERS VERSUS OTHER SYNTHETIC LUBRICANTS

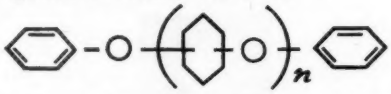
Compound	Decomposition Point, °F.	Useful Life at 900° F.*
Bis (p-phenoxyphenyl) ether	824	25 hours
m-Bis (m-phenoxyphenoxy) benzene	862	80 hours
Bis-p (m-phenoxyphenoxy) phenyl ether	832	20 hours
Quaterphenyl	826	30 hours
Silicone	740	18 minutes
n-Octacosane	662	3 minutes
Tetra (2-ethylhexyl) silicate	638	14.4 seconds
Pentaerythritol tetrahexanoate	585	7.2 seconds
Bis (2-ethylhexyl) sebacate	525	7.2 seconds

**Time to decompose 10%*

Heat stability is one important facet of these new molecules. The polyphenyl ethers also match the lubricity and viscosity indexes of other good lubricants and possess better hydrolytic stability. They are two to five times more stable than most other synthetic fluids under nuclear radiation.

THE PROPERTIES OF THE MOLECULES

The unsubstituted polyphenyl ethers have the general molecular structure:



The "*n*" values range from 1 to 8, each with linkages in various combinations of the *ortho*, *meta* and *para* positions. The various isomeric polyphenyl ethers are all good lubricants: they show heat stability within a narrow range (the 7-ring ether decomposes only 20° F. higher than the 4-ring ether; a 5-ring appears to have the optimum thermal stability).

Varying the chain length does not materially affect lubricity or heat stability—as chain length increases so does pourpoint, and, conversely, volatility decreases. A 7-ring *meta* ether boils at 1150° F., has a pourpoint of 70° F. Chemically "tailoring" and blending can provide optimum lubricant properties.

While the properties of these fluids may solve many needs, the chemical expedition which found them set out to answer the specific problem of advanced turbojet engine and accessory lubrication. Turbine bearings, surrounded by hot gases, must be kept clean, cool and smooth-spinning. (*Please turn page.*)

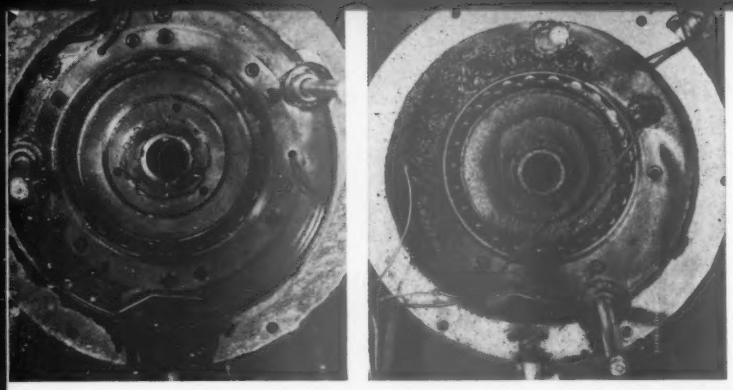
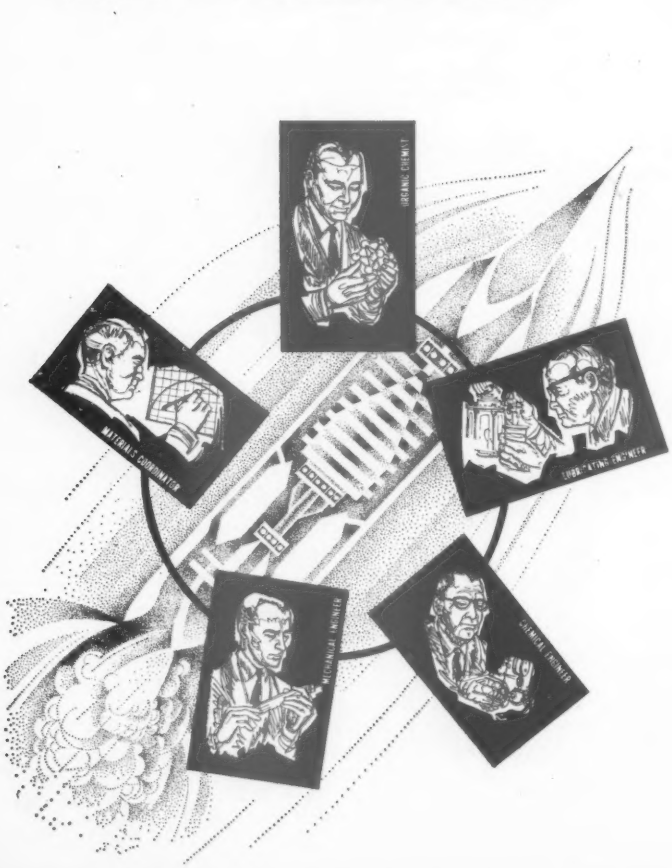


Photo Courtesy Pratt & Whitney Aircraft

Test rig parts for evaluating thermal and oxidative stability and lubrication properties of jet engine lubricants show how a polyphenyl ether (left) leaves the rig parts clean, free of deposits, and with no evidence of wear. Photo at right shows deposits and general condition of parts using one of the best synthetic lubricants prior to development of polyphenyl ethers. Both tests were run at a bearing temperature of 500° F. for 100 hours at a speed of 10,000 RPM.

Between Mach 3 and Mach 4, the skin temperature of craft in sustained flight at 40,000 feet can rise to 900° F., the temperature where steel glows red. In the lubricant reservoir, the polyphenyl ethers withstand this stress. Consequently, for speed brakes, hydraulic controls, fuel pumps and other internal moving parts, polyphenyl ethers can cope with the "heat barrier" to provide reliable performance.

Monsanto's polyphenyl ethers are a new link in the design chain leading to advanced engines and weapons systems with a minimum of "compromise" for lubricant and hydraulic fluid limitations. In present systems just "getting by" with marginal performance of earlier lubricants, the polyphenyl ethers can provide greater reliability.



SYNTHETIC FLUIDS FOR SPACE-AGE ENGINEERING

Monsanto has had 15 years' experience in the development of synthetic fluids and lubricants; currently markets over 20 fluids with applications that range from electronic coolant-dielectrics to fire-resistant hydraulic fluids for jets and radiation-resistant fluids for nuclear power plants.

If you require a fluid or lubricant for special use in an application of high stress, contact Monsanto. The material you need may be readily available or within "easy chemical reach." Write or call: MONSANTO CHEMICAL COMPANY, Department 02-B, C Building, St. Louis 66, Missouri.

Monsanto Space-Age Projects for Government and Industry

* High-Temperature Hydraulic Fluids
* Coolant-Dielectrics for Electronic Equipment
* High-Temperature Plastics
* Improved Nitrogen Oxidizers for Solid Propellants
* Fire-Resistant Structural Plastics
* Hydrocarbon Fuels for Jets and Missiles
* Fire-Resistant Hydraulic Fluids for Ground-Support and Missile-Launching Equipment
* Radiation-Resistant Heat-Transfer Fluids
* High-Temperature Lubricants and Additives
* Radiation-Resistant Reactor Coolant-Moderators
* Intermetallic Semiconductor Materials
* Pure Silicon for Transistors, Rectifiers, Diodes
* Ultra-Fine Metal Oxides
* Materials for Vibration Damping
* Heat-Resistant Resins for Laminating and Bonding
* Inorganic Polymers
* High-Energy Solid Propellants

Monsanto

You are invited to work with Monsanto on your materials needs in the above fields.

But now AFSSC found itself dealing in its recommendations with products as far apart as desks and bearings. No longer could the single manager supply group be called "pure."

By the same token, it was no longer as easy to spot the most logical manager at first glance. In naming a recommended manager, there were about twenty criteria followed by AFSSC—just about everything from use rates to dollar volume of inventory. But even these complicated factors were compounded by the more technical new item areas.

With the Automotive and Construction Supply single managers, the situation changed again. Technically, there is no comparison between ball-point pens and vehicle assemblies and repair parts.

The single manager found himself working with actual programs—from research through to phase out. Lead time, development planning, production considerations—all became a part of his job.

For the first time, the single manager handled equipment closely related to end items, in the combat sense of the term.

Now it wasn't simply a matter of being six months late with a dozen pencils. For the want of a bulldozer blade, a convoy under fire could be stymied by a shell hole in the road—and be reduced to scrap metal.

In the past, then, the trend in single managership has been from the simple to the complex—from pure categories to mixed ones—from support to operational—from simple purchase to more of the full development cycle—from low item cost to high—from narrow definitions to broad.

In setting up a single manager recommendation, item management coding is probably one of the most important and valuable management tools.

How Coding Works

Basically, it works this way: In evaluating supply work at a given location, the service in charge is asked to code its supply items for military essentiality and type of management. Each item stocked falls into one of three categories.

First, it may be so vital to the job of the service that the service must retain management in-house. Second, it may have enough military and management peculiarities to be kept within Defense Department, but not necessarily enough for retention by the rating service. Finally, it may work most efficiently managed by a non-Defense agency (usually General Services Administration) or bought locally.

What this Navy-initiated coding system does is to tie the supply item directly to the mission it supports. Plainly, side-stepping this would make any supply operation meaningless and unrealistic—in terms of the precise reason for which it was set up.

Describing the electrical/electronic supply area involves a broad definition. It is highly complex, it is a mixed category. It definitely crosses over to the operational area. Full development cycles are involved, and item costs are high, and items managed are integral to weapon systems.

Which Way to Decision?

Again quoting Col. De Luca, "we are looking into two huge commodity areas, and there's all the difference in the world between E&E and office supplies or paint. What we will provide is the vehicle of fact and logic on which review and decision will be made by the services, JCS and OSD."

Adds AFSSC Director Herman C. Hangen, "We ran a crash program on Automotive and Construction. I'm sure that a more careful, thorough job would have been valuable in the work the Analysis staff is doing in E&E."

In developing the "vehicle of fact and logic" for E&E, AFSSC's Analysis Staff is using nine men, working to gather all of the information needed to build a case for their eventual recommendations. The process is a thorough one, and one that carries weight in its final form.

Directed by the Armed Forces Supply Support Council, the Analysis Staff works only on assignment. In E&E they were told to find the "optimum course of action." The means to the "optimum" end can only be called exhaustive.

On a major supply installation, for instance, the nine man team of analysts spends about ten working days.

The first two days are devoted to briefings by installation personnel. These briefings cover how they are organized, what they are doing, what their responsibilities are, what their policies are, what policies are handed down to them.

The other eight days go into research, with each of the nine team members working a specialized area, looking into every corner and under every rug of the organization under study. ("What we are looking for is how E&E material is managed—and if there is any difference between what is supposed to be and what is.")

Obviously, the key to success in such an operation in service cooperation. According to Col. De Luca, the services are going all out to help build a top level study.

The nine study areas are: (1) Operations, research and development, industrial mobilization; (2) Requirements, and how they are set; (3) Procurement, provisioning and production policies; (4) Distribution patterns and priorities.

Also, (5) Maintenance; (6) Finances, including budgeting, fiscal and accounting practices; (7) Cataloging and standardization; (8) Interservicing; and (9) Item Analysis.

The researching phase of the Analysis Staff job is the most time-consuming. In E&E, for example, this part of the job was begun in January, and continues through October.

Basically, the AFSSC Analysis work program contains five actions: Dig, Think, Deliberate, Decide and Write.

This is the distillation that E&E is presently going through, and it is the one that the last four single manager areas went through.

It is a wringing out by an objective staff—whose objectivity efforts seem to be successful since they have never had a major recommendation turned down.

"The Success Achieved . . ."

Col. De Luca sums it up: "We have a beautiful role. We need and maintain detachment, and we can provide the Armed Forces Supply Support Council with a fully independent logistics management analysis.

"We have no daily fires to put out in the sense that the operator does, and we can't commit anyone to a decision—unless we convince him first."

Working in this framework, and to these ends, AFSSC has found itself with a boost from Congress along the E&E path. In a report on Military Supply Management—particularly single manager progress—the House Committee on Government Operations had this to say:

"The success that has been achieved in common supplies only confirms the . . . belief that intensive management might profitably be used in the so-called technical items."

Whether or not AFSSC's analysis staff comes up with a Single Manager recommendation for electrical/electronic supplies—and there would seem to be a good chance of it—it will, almost without doubt come up with what was asked of it—an "optimum course of action."

PART II

New Look in Navy Research: Management Techniques

by
Capt. Carl O. Holmquist
Technical Assistant
Office of the Assistant Secretary of the Navy (R&D)

IN ANY RESEARCH and Development program, one of the most important phases is planning. This is especially true in our present era where state-of-the-art in many fields is moving so rapidly that many weapons and much equipment are obsolescent by the time they become operational.

Closely allied with the planning phase in Navy's new research and development organization is periodic progress reporting by developing agencies. A brief description of Navy research and development planning and reporting shows much of the philosophy of operation and the processes for carrying out research and development in the Navy.

The following is not a complete list. There are many other internal documents and reports concerning the research and development program.

Long Range Objectives—Navy's Long Range Objectives are prepared in the Office of the Chief of Naval Operations and cover a period extending about 15 years into the future. They are based on predicted military threat, trends in national policy and the predicted state of the technical arts.

The Long Range Objectives are revised yearly and currently cover from 1969-74. LROs are concerned primarily with strategy, tactics and fleet composition in the future, but research and development implications are spelled out in the document.

Bureau Long Range Plans—Closely related to the Long Range Objectives prepared by CNO are research and development Long Range Plans of the principal procurement bureaus—Bureau of Naval Weapons and Bureau of Ships. These plans are developed to be consistent with LRO's and try to predict equipment and weapons to be developed, based on estimated interim technological advances.

Projected Program Objectives—Projected Program Objectives are medium range plans and projected requirements for the next five years, prepared by the CNO General Planning Group. This document has an R&D annex providing general guidance for over-all Navy research and development for the next five years.

Annual Program Objectives—Annual Program Objectives are also prepared by CNO and, after approval by the Secretary of the Navy, are promulgated throughout the Navy.

Annual Program Objectives are prepared from the Projected Program Objectives. They contain a section on research and development which guides bureaus and offices in developing systems and new equipment expected to be available to the fleet within three to five years.

System Concepts—A System Concept expresses in general physical terms a system to support R&D planning objectives and Navy strategic plans. These are prepared by CNO and the Marine Corps Commandant to present general performance for systems expected to be developed during the time periods coinciding with those of the Long Range Objectives.

Means to an End

Operational Requirements—An Operational Requirement is a statement addressed to a bureau or office, outlining in broad terms performance to be attained in a specific weapon or support system. Operational Requirements are normally set by various warfare desks of CNO and promulgated by DCNO(D).

But an Operational Requirement can originate anywhere in the Navy. It contains such information as a general description of equipment needed, completion date desired, other equipment affected, training and personnel needs and research considerations in developing the proposed equipment.

Development Characteristics—Development Characteristics derive from Operational Requirements and relate directly to them. But the Development Characteristic gives performance and characteristics in much more detail.

Technical Development Plan—Following the Development Characteristic set by CNO, a Technical Development Plan is prepared and issued by the action bureau on the Operational Requirement. These give detailed resumes of characteristics of weapon components and sub-systems and all other amplifying data needed for program review.

Exploratory Development Plans—The developing agency also prepares Exploratory Development Plans. These are the Bureau's recommended approach on fulfilling a requirement leading to improved or new components.

R&D Project Card—The DD-613 Project Card is a report on major development systems which has been used by Defense for many years. There are about 450 DD-613 Project Cards in Navy's current program.

Annual Navy RDT&E Program—This is a line item list of projects that comprise Navy's RDT&E program. It is prepared by the bureaus and offices and compiled by ONR. In it, the program is also summarized by budget projects and budget activity.

In summary, the entire Navy research and development process begins with customer needs.

Policy guidance and top level direction come from Navy Research Advisory Committee.

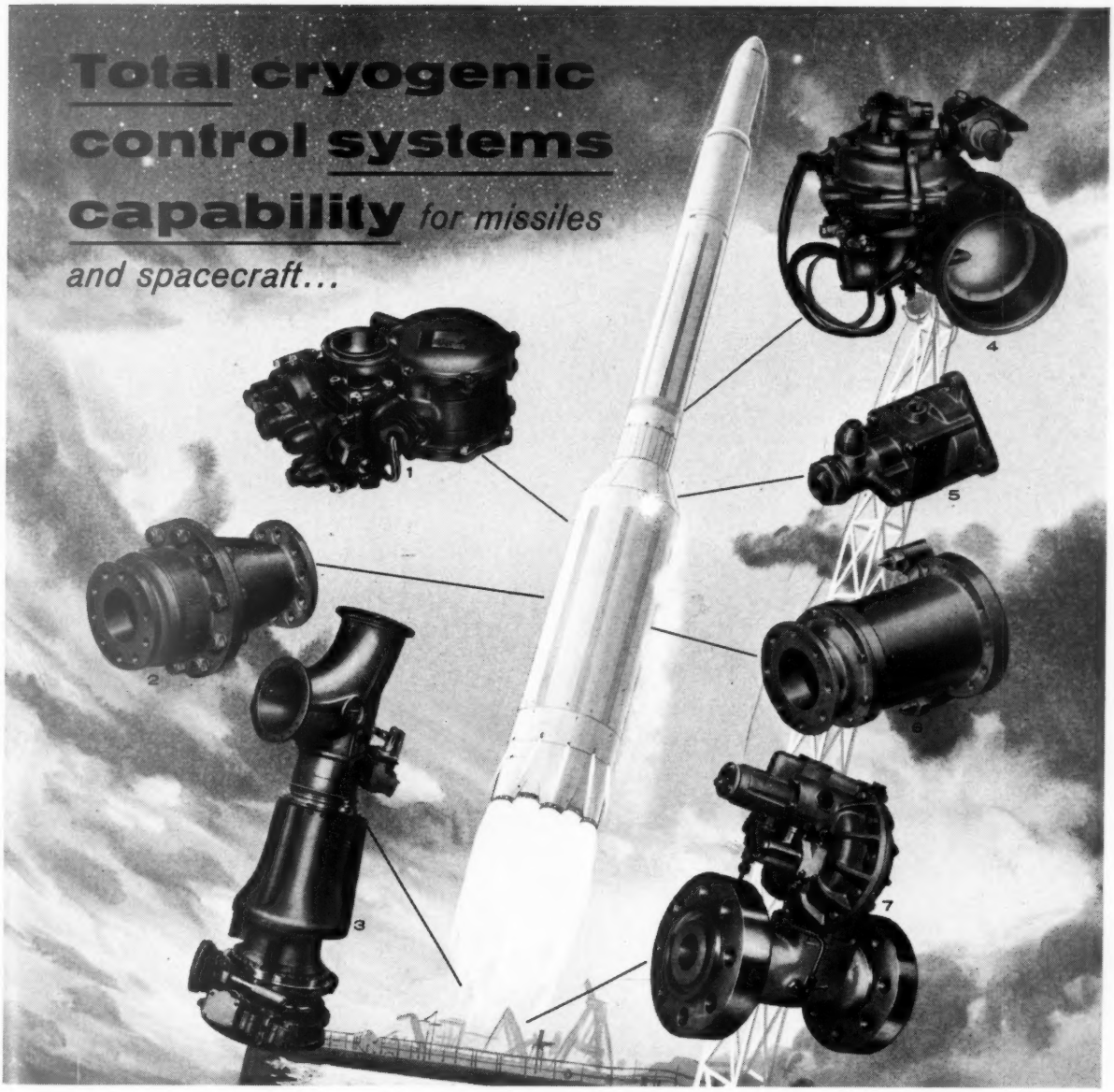
Policy guidance also comes from Director of Defense Research and Engineering and the Joint Chiefs of Staff. But most requirements for naval equipment and systems are generated in the fleet and the Marine Corps.

Information on guidance and requirements is submitted to Assistant Secretary of the Navy for Research and Development, who sets guidelines and instructions for preparing and submitting the Navy research, development, test and evaluation program.

Chief of Naval Operations issues specific Operational Requirements for systems and equipment based on policies, guidelines and operating force's needs. These go to the bureaus and offices, and Technical Development Plans are written and returned for CNO approval. Upon approval, the bureaus or offices are directed to go ahead. If Development Characteristics are required, they are issued by CNO.

At this point, bureaus and the Office of Naval Research prepare specific projects on required development or procurement action.

Work proposals are consolidated into individual bureau programs. After bureau review and coordination, the various bureau and office programs are consolidated by ONR. When dollar



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The superior reliability of AiResearch cryogenic systems and components is backed up by more than 20 years of experience as the largest producer of valves and controls in the aircraft and missile industries. This capability includes liquid and gaseous fuel and oxidizer components and systems operating at temperatures ranging from −420°F. to more than 2000°F.

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6. *Airborne liquid propellant shutoff valves.*
7. *Ground support pressure regulator and shutoff valves.*

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STRANGE "FISH" UNDER THE POLAR ICE!

Revolutionary RCA Magnetic Video Tape Recorder to Speed Navigation Training of Submarin

Aboard the nuclear submarine *Sea Dragon*, the first undersea magnetic video tape recorder will record and store data on under-the-ice characteristics from externally installed TV cameras. Upon return to base the recorded information will be displayed for the benefit of undersea service trainees, greatly increasing their understanding of hazardous polar navigation techniques. The recorder, a joint U.S. Navy-RCA effort, is a marvel of compact design (dimensions: 20″x2 100″). It nestles securely in the limited confines torpedo rack, yet represents a 60 per cent sp reduction over existing commercial video tape equ ment. Designed to the curvature of the torpedo rac will fit through the opening of a 24-inch hatch. Tho small in size, the 4 megacycle recording it produ is fully compatible with its commercial counterpa

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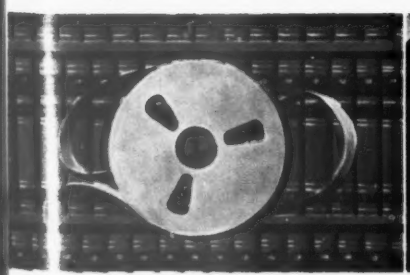
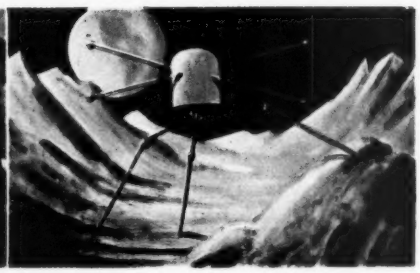


Coming for business—a "video file system" capable of storing an entire encyclopedia on one 12½ inch reel, contents of which would equal 20 billion bits of information!

Coming for entertainment—the ultimate in color TV and video fidelity . . . via extremely portable recorders that will provide a panoramic view of world events virtually as they happen!



Coming for science—completely unattended recorders, robot-rocketed to the moon, will, on command, provide a detailed "picture" of space, free of the earth's atmosphere!

Other exclusive RCA recorder developments now contributing to national security include—the "Tiros" satellite recorder, designed for weather observation in outer space; a radar recording system to take the first pictures of a nose cone re-entry vehicle; a unique tape cartridge adaptable to *any* size recorder. For information on opportunities in creative engineering write: G. R. Gordon, **Defense Electronic Products,** Radio Corporation of America, Camden, N. J.

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What's it costing you to train new drivers?

$1,000? $1,500? $2,000? These are normal costs for training new operators —except for TORQMATIC DRIVE owners. They report saving up to $2,000 every time they break in a "rookie."

Reason? TORQMATIC takes guesswork out of shifting – ends shock-load damage and the need for engine-disconnect clutch repairs. TORQMATIC *automatically* adjusts engine output and speed to load or terrain changes.

TORQMATIC owners know that no operator can handle the "stick" and clutch as smoothly and efficiently—*every* time – as an Allison TORQMATIC. They bought TORQMATIC because they know, too, what it costs when rookies make a shifting and clutching mistake.

How can you eliminate these costs?

Look beyond first cost and see the total cost. Then change from clutch-pedal equipment to Allison TORQMATIC. You'll save costly engine-disconnect clutch replacements, too-frequent overhauls of overtaxed engines, repair bills for shock-load-damaged axles and drive lines.

Why not get the full story today? See your equipment dealer or write Allison.

ALLISON DIVISION OF GENERAL MOTORS
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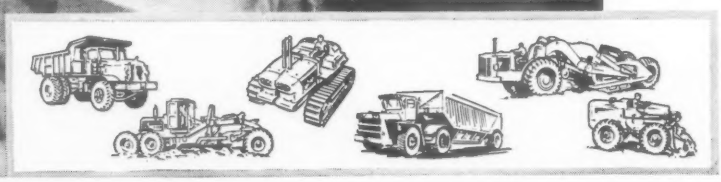


TORQMATIC® DRIVES
THE MODERN DRIVE FOR MODERN EQUIPMENT

amounts go into the RDT&E program for a given year, the program becomes the year's budget.

The annual research and development program is reviewed and modified in CNO's Office by the Research and Development Review Board, under DCNO(D).

To this point, major effort has been aimed at content and funding implications of the R&D program. Once NRDRB has reviewed the program and is satisfied that it is an optimum program, the consolidated program is sent up one echelon to CNO Advisory Board, headed by Vice Chief of Naval Operations, with all Deputy Chiefs as members.

The board reviews the total Navy program and budget and, among other things, recommends to CNO what part of total Navy effort should be spent on R&D plus other Navy programs.

When final decision is reached, CNO forwards the Navy budget to the Secretary of the Navy. As part of the built-in bilinear check and balance system, the Assistant Secretary of the Navy for R&D at this point convenes Navy Research and Development Committee to aid him in the review.

This committee consists of Deputy Chief of Naval Operations (Development), Chief of Naval Research and the Assistant Chiefs of the Bureaus for Research and Development. At this level, the "producer" side of the Navy can appeal any actions taken by the Office of the CNO.

Finally, when the R&D program has been reviewed and okayed by the Secretary of the Navy, it is consolidated and forwarded to Defense.

Several years ago, Henry L. Stimson wrote with more humor than insight that the Navy was organized with a peculiar psychology which ". . . frequently seemed to retire from the realm of logic into a dim religious world in which Neptune was God, Mahan his prophet and the United States Navy the only true Church."

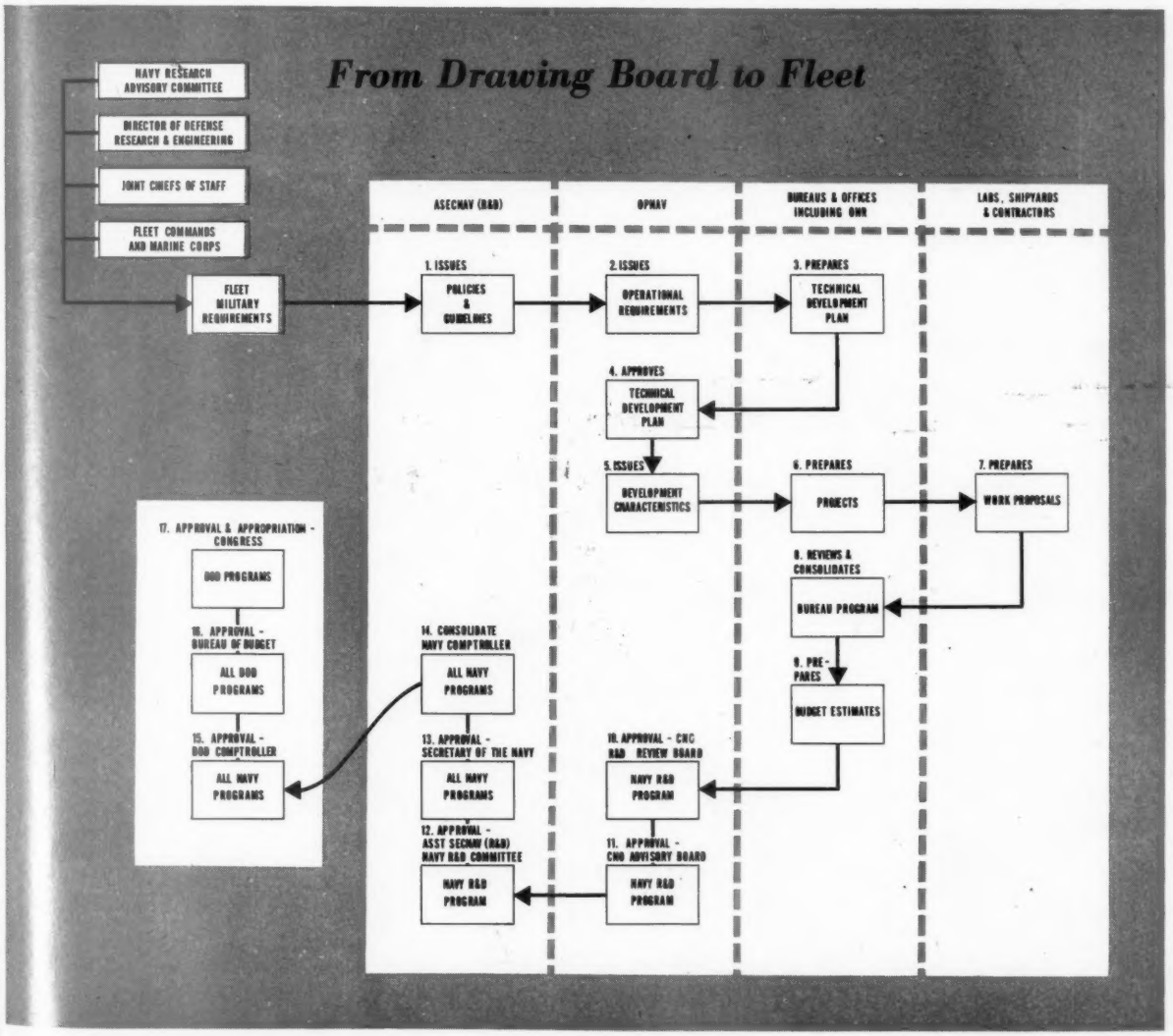
For any reader who has had the tenacity to struggle this far through the story of the Navy's organization for research and development, Stimson's words may have some appeal.

But the Navy, particularly its research and development structure, has evolved over the years to satisfy its own peculiar needs. Diverse operational responsibilities have led to many differing weapon and equipment types.

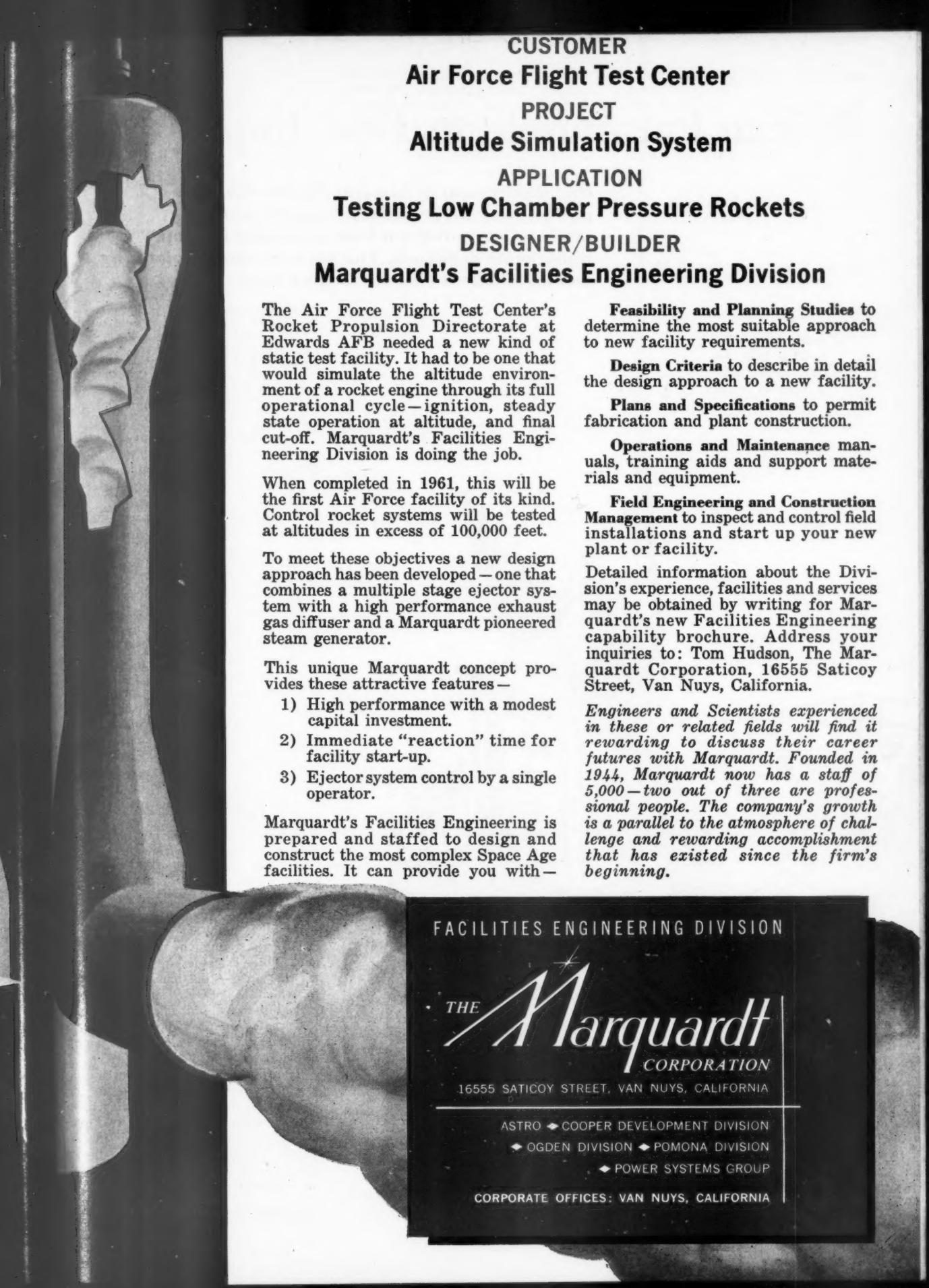
Navy has discovered, like many large and diversified corporations, that a simple pyramid organization is not the best for managing broad research and development programs.

Navy's system works because it allows technical and professional talent maximum flexibility and individual initiative in day-to-day work, subject only to requirements and general guidance from top management.

Like any system, its success depends on efforts of competent and dedicated men. It is the nation's good fortune that Navy has never lacked these.



ANOTHER FACILITIES ENGINEERING FIRST



CUSTOMER

Air Force Flight Test Center

PROJECT

Altitude Simulation System

APPLICATION

Testing Low Chamber Pressure Rockets

DESIGNER/BUILDER

Marquardt's Facilities Engineering Division

The Air Force Flight Test Center's Rocket Propulsion Directorate at Edwards AFB needed a new kind of static test facility. It had to be one that would simulate the altitude environment of a rocket engine through its full operational cycle—ignition, steady state operation at altitude, and final cut-off. Marquardt's Facilities Engineering Division is doing the job.

When completed in 1961, this will be the first Air Force facility of its kind. Control rocket systems will be tested at altitudes in excess of 100,000 feet.

To meet these objectives a new design approach has been developed—one that combines a multiple stage ejector system with a high performance exhaust gas diffuser and a Marquardt pioneered steam generator.

This unique Marquardt concept provides these attractive features—

1) High performance with a modest capital investment.
2) Immediate "reaction" time for facility start-up.
3) Ejector system control by a single operator.

Marquardt's Facilities Engineering is prepared and staffed to design and construct the most complex Space Age facilities. It can provide you with—

Feasibility and Planning Studies to determine the most suitable approach to new facility requirements.

Design Criteria to describe in detail the design approach to a new facility.

Plans and Specifications to permit fabrication and plant construction.

Operations and Maintenance manuals, training aids and support materials and equipment.

Field Engineering and Construction Management to inspect and control field installations and start up your new plant or facility.

Detailed information about the Division's experience, facilities and services may be obtained by writing for Marquardt's new Facilities Engineering capability brochure. Address your inquiries to: Tom Hudson, The Marquardt Corporation, 16555 Saticoy Street, Van Nuys, California.

Engineers and Scientists experienced in these or related fields will find it rewarding to discuss their career futures with Marquardt. Founded in 1944, Marquardt now has a staff of 5,000—two out of three are professional people. The company's growth is a parallel to the atmosphere of challenge and rewarding accomplishment that has existed since the firm's beginning.

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How to Put Muscle in Cost Improvement Wo

One department of General Electric Co. has put together an organized research cost improvement program that is turning in some remarkable dividends. The keys are careful planning and an excellent climate for new ideas.

Savings of nearly $500-million resulted from one missile transportation program at GE.

MANY COMPANIES, large and small, have cost improvement programs to lower product costs, the better to serve their commercial customers.

Most such programs aim at cutting production costs—working with manufacturing processes repeated dozens, hundreds, or thousands of times each week.

At the Missile and Space Vehicle Department of General Electric, missile nose cones, space vehicles, and other hardware items are produced, but in much smaller numbers.

Our basic product is research and development, handled on a cost-plus-fixed-fee or cost-plus-incentive-fee basis, not repetitive, assembly-line hardware production.

In this type of work, competition is strong and becoming stronger. The term "incentive contract" itself implies the importance of cutting product costs in research and development work.

With this in mind, MSVD two years ago kicked off a Department Cost Improvement Program. The three goals set: To reduce costs, to eliminate them and to avoid them.

By avoiding the narrow term "cost reduction" we recognized three types of savings. By dubbing the program "cost improvement" we found that reductions, eliminations and avoidances of cost worked together to provide us with 26% more in savings than a strict "cost reduction" program would have. Three examples are representative of the areas—functional and cost—in which MSVD has successfully attacked the cost problem.

Case I. A cost avoidance program in our engineering field reaped largest individual savings for us in 1959.

Transporting re-entry vehicles from assembly and checkout areas to the launch pad, and there assembling them with boosters, was done by two specialized vehicles. We found that a single vehicle—a standard trailer chassis with a special lift device and superstructure—could do the job

Work

G. H. Jacobsen

Cost Improvement Specialist
Missile and Space Vehicle Department
General Electric Co.

quicker, easier, cheaper, and with less danger of damage.

By applying the new method to similar programs already underway and setting it up for future programs, we saved $481,000.

Case II. Large savings resulted from a cost reduction program in the administrative area.

A series of missile provisioning documents with several formats, entry sequences, and non-uniform data titles were the basis for provisioning negotiations with customers. These documents were prepared by hand. A planned effort to simplify and clarify formats, and to mechanize document preparation saved $107,000. Also, previous provisioning conference confusion was alleviated.

Case III. Elimination of cost in the hardware area under development manufacturing saved $520, on purchase of small hand tools. This purchasing has been discontinued in a particular development manufacturing operation.

In achieving these savings, two major aspects of the Cost Improvement Program are heavily responsible. By (1) creating a climate for cost improvement, and (2) using planned projects, we have been able to sow the cost improvement idea and reap a large harvest of savings.

Savings that add up to $13.3-million over two year period cannot be had without an adequate climate for cost improvement. To get the degree of fertility that these savings imply we hit upon five features which we feel cannot be over-stressed.

The first of these features—strong management support—involves several factors. Besides making cost improvement a direct responsibility of our Manager, Operations Analysis, this man reports directly to the Department General Manager, who has a keen interest in the success of this work.

One reason for this interest is that a stated program objective was to improve costs in development engineering. In retrospect, during the past two years savings in this general area totalled 60% of total savings. We feel management support was well justified.

A second important feature of our climate was to provide publicity, communication and recognition aimed at keeping employees as well as management informed on cost improvement. Annual C.I. targets are assigned throughout the organization, and monthly progress reports go to all managers and are published in the plant newspaper. Details of actions and savings are also printed regularly.

Recognition—a third factor—is given in a number of ways. Acceptance letters go to the proposer, his manager, and his personnel file. Token awards—lighters, pen sets, electric clocks—also provide incentive, as do inscribed certificates for larger savings.

Cost improvements are self generating. Publicity on accepted ideas trigger ideas elsewhere. Cost consciousness is contagious, and this contagion helps produce ideas sooner than otherwise might occur.

A fourth climate feature is to create customer good will and approval of our activity. This is particularly true for the military customer. As an example of our work in this area, in 1959 several presentations were made to military customers.

At one of these, an outline of the MSVD program was given to the Commanding Officer at Middletown Air Force Base. Differences between cost improvement in research and development and the traditional cost improvement program in the production area were stressed.

The R&D Difference

The fifth climate-setting feature in the MSVD Cost Improvement program is our stress on and acceptance of cost improvement as an integral part of all jobs. Managers may and do use C.I. activity as one element in personnel appraisal. Job descriptions contain either direct or implied statements on cost responsibility. Review of individual or group C.I. work affords objective measures of response to this assigned responsibility.

Because our C.I. work is primarily in research and development, and because this type of work is usually associated with production and manufacturing, it is worth noting four major differences in these two kinds of programs.

These are the research and development nature of our work, the methods of measuring savings, the program climate as a basic part of each job, and the difficulty of estimating costs of research technical work with its changing requirements, unforeseen problems, and varying reliability elements.

We define C.I. as "giving the military customer more development for his dollar by inciting engineers and scientists to continually seek and practice short cuts in attaining their goals and applying common sense both in setting technical goals and in working towards them."

Defined this way, at least 75-90% of our improvements would have come from intelligent and creative people anyway. But at MSVD, we want to clean up the other 10-25%.

In research and development C.I., savings do not necessarily go directly to the customer, although he benefits in every case. A good project manager knows in advance of a given project that his engineers and scientists will probably come up with the normal 75-90% of cost improvements. Thus, he deals in the 10-25% cost improvements above and beyond those anticipated in his cost estimates.

Where Savings Go

This small portion of saved funds must be applied to the vague requirements of R&D work. Because R&D does not necessarily deal in hardware, funds saved are often needed to expand original requirements, run additional tests, or increase reliability. Any or all of these give the customer a better job, even though unmeasurable in dollars.

In some cases, of course, the customer obtains direct savings. But even without this, R&D cost improvement is worthwhile, for it may allow expanded requirements, improved equipment, better reliability or similar "plus" elements.

To achieve these savings, MSVD uses both random search proposals and planned projects. Random search—as the name implies—is basically taking what comes along.

But a planned project is a directed, scheduled, and sustained effort to improve costs. Ideas for these projects develop from reviews of problems, existing ways of doing things, and possible application of available resources by managers and personnel throughout MSVD.

From this genesis, the manager authorizes work on the projects and assigns personnel. By using planned projects we have achieved some startling results. Savings from them amounted to $2.5-million—a third of all savings in 1959. On the average, planned improvements were three times the dollar value of random search ideas.

Our four basic criteria for accept-

(continued on page 53)

HOW SEMO SIMPLIFIES EL

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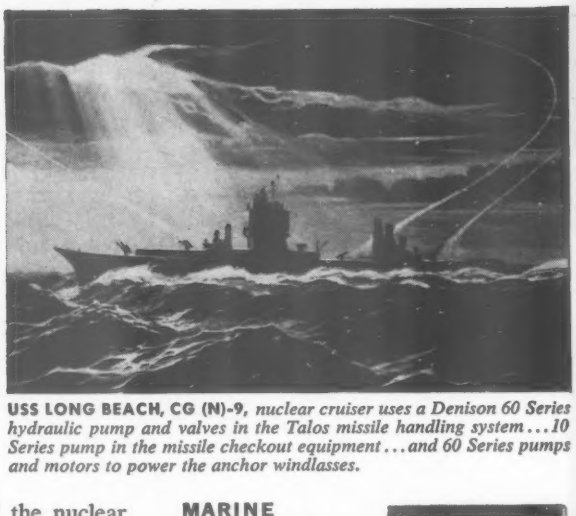

USS LONG BEACH, CG (N)-9, *nuclear cruiser uses a Denison 60 Series hydraulic pump and valves in the Talos missile handling system... 10 Series pump in the missile checkout equipment... and 60 Series pumps and motors to power the anchor windlasses.*

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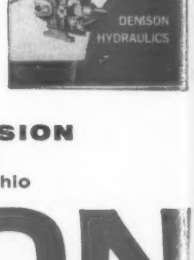

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Pentagon Profile

This Month:

Hon. Hugh Meglone Milton II

Under Secretary of the Army

IN NOVEMBER this year, Hon. Hugh Meglone Milton II, Under Secretary of the Army, will celebrate his seventh anniversary working at the Secretarial level in the Army.

Says Milton, "I've been at this nearly seven years, and there are still areas in which I can't honestly say I've had a chance to get my feet wet."

Looking forward to the anniversary, and injecting the note of humor which tends to work into his speech, Milton says, "these have been tremendously rewarding years. I wish I'd had the experience 30 years earlier. I would certainly have made a better University president."

Born in Lexington, Ky., Under Secretary Milton came to his present job by what can only be called a circuitous route. He was eminently successful in two other career fields before trying his hand at Secretariat-level military management.

"I have never specialized much," says Milton, "My wife often says that I wouldn't be happy if I weren't able to concentrate on more than one thing. I suppose you might say that I've covered a broader field than the average teacher."

Milton began his academic career in the early 1920's, teaching engineering, his undergraduate major. Starting at Texas A&M, he moved to New Mexico A&M in 1924, became Dean of the Engineering School and finally President of the University in 1938.

The Military Career

More interesting is Milton's military career, beginning as an enlisted man in World War I, and carrying through to his present rank of Major General in the reserve. With the XIV Corps in the Philippines, Milton was awarded a Silver Star for his part in retaking Luzon and Manila.

"I have served in uniform during two of the last three wars, and served in the Pentagon for a part of the third. You know these old war horses, we just can't seem to give up."

From this diversified background is drawn Milton's way of doing business in his present job. From his engineering years, "I gained what is called, I suppose, an analytical mind. I also discovered along the way that you can be too closely wrapped up in your subject, too bogged down in perfectionism.

"Once when I was teaching, I was doing some heavy research in thermodynamics on my own, aside from the classes I taught. I found myself assuming that my undergraduates could follow every equation that I put on the blackboard, and then becoming somewhat annoyed when I realized they couldn't. I had become too close to my subject to have the patience to teach it."

The Big Slide Rule

From the military, Milton says, "I learned to religiously avoid just the concept of 'the big picture'. We were often told at Command and General Staff School that the field commander was wrong to tie himself down with platoon-level details, and should concern himself with this big picture idea. And yet as soon as I found myself in battle—and I think this is true of any commander—it became immediately clear that a field of fire between two infantrymen can be just as all-important as any large type operation."

Somewhere between these two extremes lies the point where the manager operates most effectively. The rule of thumb used by Milton: "In my job, I work with policy. I ought not to get into operations unless they slack off in carrying out Army policies directed by the Secretary of the Army. But in setting these policies, it is absolutely necessary to know the details involved."

On the lighter side, but still to the point, is the carbine-sized leather-sheathed slide rule Milton keeps in his desk. "It's the best psychological weapon in the office. I have caused some backing away from absolute statements just by unsheathing this and laying it on the desk."

In the second highest job in Department of the Army, Milton is in a position to comment on the overall management situation in today's Army:

"In the not so distant past, Army has come a long, long way in developing better business management. Historically, the job of the man in uniform is to *defend*, and in the past we have tended to accept as logical that there should be a lack of concern with business aspects of the job.

"Today we are in the middle of a cold war that shows no sign of easing for some time to come. It becomes a matter of fighting with resources, instead of guns. This means a heavier emphasis on management—good management in the business sense—than ever before.

"It means such minor items as stencilling prices on vehicles to develop troop-level cost consciousness, and it means impressing all of our military leaders over and over again with the need for economy."

Why a Clean Desk

An example of what Army expects more of in the future is Operation Overdrive (see page 16, this issue). Comments Milton, "I definitely look for a trend towards more of this sort of thing. It has been very beneficial, and we must constantly explore areas for improvement along these lines.

"We must lay responsibility for this on the doorstep of the commander, because this is where it ultimately belongs."

The job is big, and the problems are broad. But the man who holds the job is willing to apply his own standards to himself. Looking across the blotter and penholder that are the total inventory of the top of his desk, Milton says, "To stay on top of this job you have to keep your desk clean. The minute mine begins to stack up with papers, I know it's time for me to take a new look at the way I'm handling the job that's underway."

Research Rundown

ONE MORE TRY TO GET AN ATOMIC AIRPLANE IN THE AIR is being spearheaded by Defense Director of Research and Engineering Dr. Herbert York. Comments one of York's staffers, "he's in with both feet, and he's very competent technically." Since management direction has undoubtedly been lacking in the program, results could be forthcoming—if the strong hand is given adequate financial support.

DDRE DIPPING A HAND IN SERVICE PROJECTS has seemed to follow fairly naturally from the up-grading of that office. While there are some hard feelings in the services about this, the technique is here, most probably, to stay. According to York's office, only problem areas are probed, and without disparaging Air Force efforts, DDRE's John Rubel was in close contact with the eminently fast and successful Sky Bolt program.

AN OVERHAUL OF R&D INFORMATION REPORTING SYSTEMS is in the wind, will basically mean a standardized form of reporting for all of the Defense Department. Understandably sponsored by DDRE, the new system will hinge around the already-in-use DD Form 613, using it as standard. Variation on the theme: Service Technical Development Plans will serve as the reporting document on more complex projects.

"WE'LL USE WHAT THE SERVICES THEMSELVES USE" is the essential thought behind the DDRE program. Aim is to have the new program in full swing for use in Fiscal 1962 apportionments—about this time next year. In saying "full swing," implication is to pull in Bureau of the Budget.

TECHNICAL DATA PROGRAMMED ON AUTOMATIC DATA PROCESSING machines is another gleam in the eye of Defense research managers. Goal would be to handle maximum data in the simplest, most flexible form. Also, program data in this form would lend itself to providing fast answers on such questions as "How are we doing in troop field protection—in terms of design, research and development projects?"

PRECEDENT FOR TECHNICAL DATA ADP WORK exists in Armed Services Technical Information Agency, although on a much smaller scale. Eventually program could tie in with a National Science Foundation program to build a central file of technical information covering the entire government. Also in the "eventual" category: opening the files up to "anyone legitimate." Targets: less duplication, better use of accumulated knowledge, more effective overall scientific management.

STUDY AIMING FOR GREATER AMC/ARDC INTEGRATION has gone into the Air Staff for a decision, will probably *not* result in subordination of either major Air Force command to the other. One good bet: much closer work between ARDC/AMC WSPO's, perhaps with direct, in-the-same-office liaison where it is needed.

FLURRY OF SPECULATION TOUCHED OFF BY SITE ACTIVATION decision —giving AMC a bigger part of the missile job—probably bears little in the way of fact. On the one hand, it looked like "AMC has pulled a power play, is definitely on the make;" or if you prefer, "AMC has been thrown a crumb, will get the rug pulled from under them." Most likely and logical: AF faced a tough, specific problem, made its decision with little or no thought on this sort of crystal-balling.

Defense Plans To Aid VTOL

Office of Secretary of Defense—working through the Director of Defense Research and Engineering—will step in to help out the three services in vertical takeoff and landing aircraft work.

Aim is to help the services do collectively what they have not been able to do separately.

While every service has stated a need for VTOL aircraft, actual work has been generally overshadowed by such priority programs as missile/space work.

While each service holds its own needs to be unique, DOD feels consolidation of effort can fly an experimental craft that will meet all needs.

Defense move was made following recommendations by an ad hoc group under Air Force Assistant Secretary Courtland D. Perkins.

The Perkins' report said: (1) VTOL development has reached a point where operational aircraft can be developed for the military. But unless a set program is established for producing such aircraft a present "state of uncertainty" will continue. (2) Considerably lower development cost would be possible under a joint service development program.

And (3) As STOL distances decrease, V/STOL aircraft, when operated in the STOL mode, will become increasingly competitive in operating cost and performance.

The Perkins group said immediate work should be done to study missions of VTOL craft in assault transport, search and rescue, surveillance and ASW fighter-bomber configurations and in component development.

The group said "advent of the gas turbine type power plant including turborotors, turbopropellers, turbofans, and turbojets has made such a tremendous change in state-of-the-art that aircraft systems have VTOL and STOL capabilities are more advanced than the helicopters can now be considered.

"We now face the complicated situation in which a technical capability appears extremely important to both military and commercial operators and yet is not being developed fast enough."

Energy Conversion Work Is Assigned to ARPA

Project Lorraine—a program of advanced energy conversion basic research—has been assigned to Advanced Research Projects Agency by Director of Defense Research and Engineering.

Project aims to stimulate flow of fundamental knowledge or the conversion of energy into useful power sources, and to support selected research work in the field. An example would be direct conversion of heat into electrical power without using conventional turbine machinery.

Lorraine recognizes that energy conversion and power sources are critical in many research and development areas. Through the program, ARPA will extend early research, such as power for the satellite programs, and review all ideas with potential in the conversion of chemical, nuclear and solar energy into power.

A government-wide survey of energy conversion research has been completed, and Lorraine will attempt to fill gaps in current programs.

Although mainly a basic research program, Lorraine is anticipated to speed weapon systems development

TRANSPORTATION-MOBILITY PROBLEM—SOLVED BY CESSNA

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High mobility at low cost is just one of the reasons USAF relies heavily on the U-3A—and one more of the ways Cessna "Problem-Solving" Research is ever at work enhancing America's future in the air.

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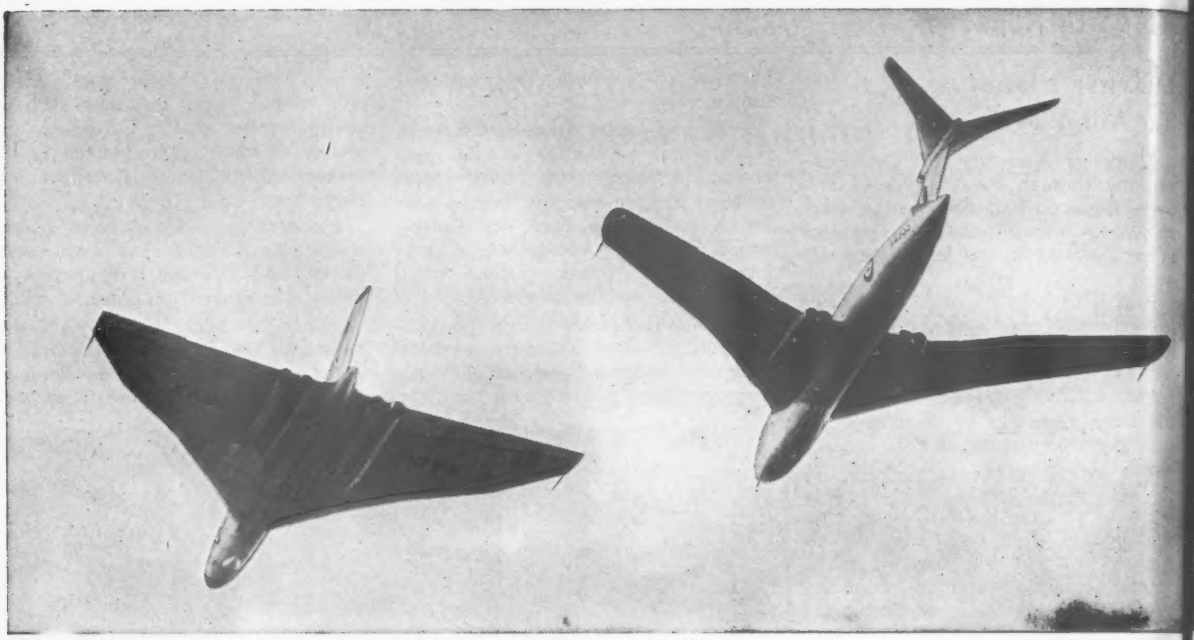
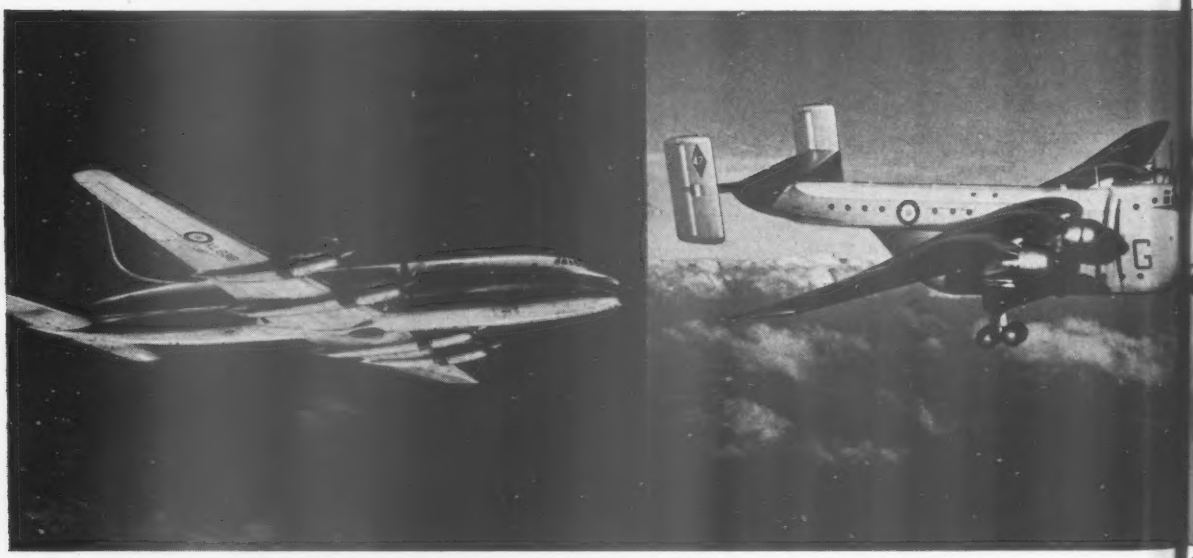


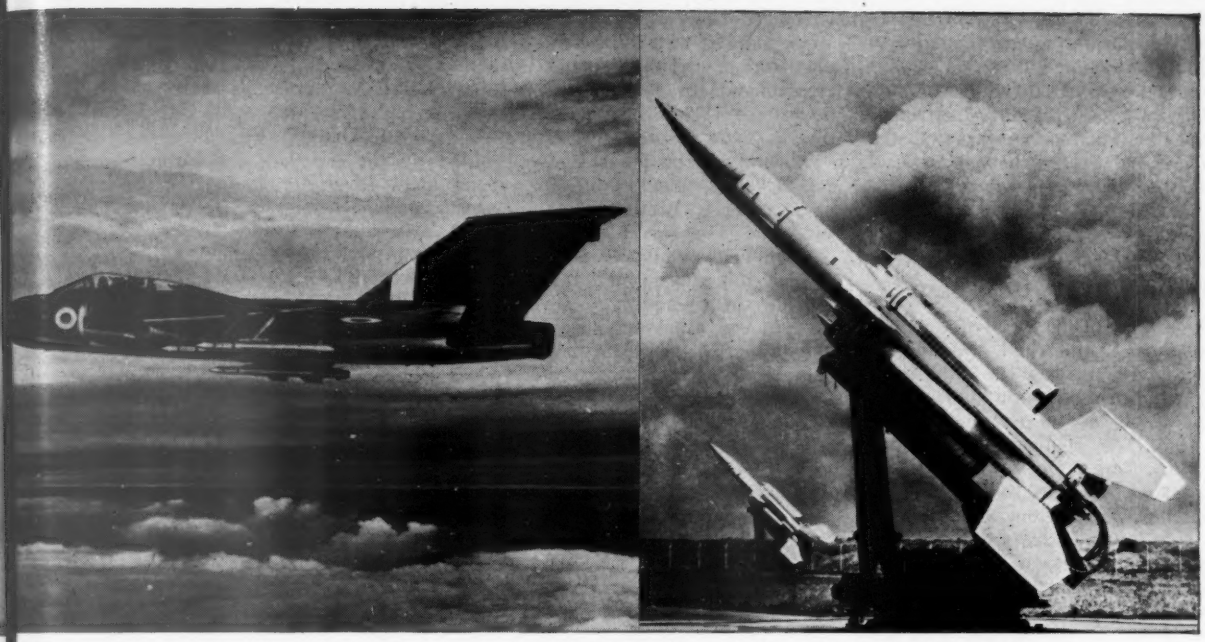
RAF V-bombers fly 10 miles a minute, 10 miles up, for 10 hours . . .



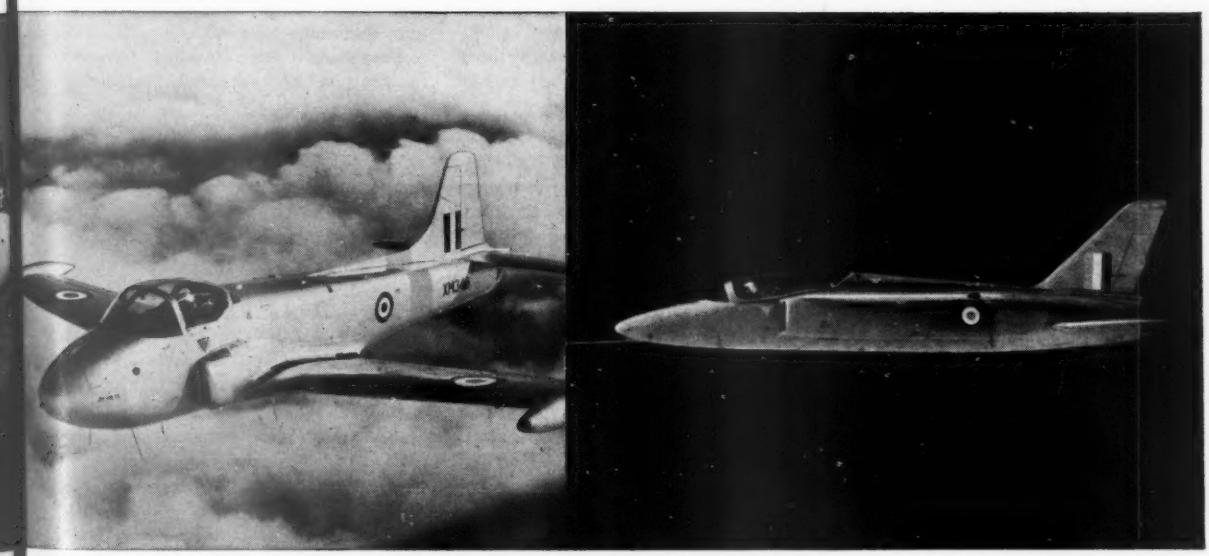
RAF Transport Command provides 5,000-mile range—20-ton payload capacity . . .

. . . AND BRISTOL SIDDELEY

Bristol Siddeley Engines Limited, one of the largest manufacturers of aero-engines in the world, supply flight power for a large proportion of the aircraft and missiles of the Royal Air Force. The most potent part of the RAF's strategic V-bomber fleet, the bulk of its round-the-clock defence, the majority of its transport aircraft and all its new primary and advanced trainers are powered by Bristol Siddeley.



RAF round-the-clock defence intercepts aircraft hundreds of miles out, far up into the stratosphere . . .



AF Training Command orders the latest primary and advanced jet trainers . . .

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that require special power sources, thereby contributing substantially to leadtime reduction.

Also, the research will eventually provide a basis for investigation of entirely new ideas in weapon system development to the benefit of each military service.

"Non-Profit" Role Detailed by Mitre Head

Developing military requirements, systems engineering and evaluation of defense programs are the appropriate fields for private, non-profit, non-stock technical advisory corporations, according to C. W. Halligan, President of the Mitre Corp.

Speaking to electronics industry leaders in Washington, Halligan said only to a lesser degree should corporations such as Mitre or Aerospace invade basic and applied research and development. Long range studies are more proper for private non-profit corporations, he said, but appropriate also for government, military and university participation.

The non-profit group has the edge of objectivity in military requirement studies, he said. This is often overshadowed by competitive motives when industry enters the field. Systems engineering, defining special systems requirements or coordinating a series of systems can also be a prime function of non-profit corporations.

But beyond this point, Halligan said, actual development work or systems engineering is "properly" an industrial function. "In general," Halligan said, "non-profit technical establishments should undertake only the projects difficult to accomplish in government, industrial or other organizations. They are primarily useful in areas where complete objectivity is essential."

The Mitre chief listed other, less complex problems that need closer study by defense industry leaders. He included cost estimating, scheduling, reliability, operability and planning.

Million Lb. Rocket Called "First Step"

Eventual rocket thrusts ranging from 10 million to 20 million pounds will make the currently contracted million-pound-thrust objective "only a first step" in rocket development.

Money obligated for the Aerojet-General contract to develop a segmented million-pound thrust solid propellant rocket booster will total approximately $4-million during fiscal 1961 Air Force has said.

In connection with this announcement, Dan A. Kimball, President of Aerojet said that "the finished product will give Aerojet engineers definite guidelines for development of a massive unit of a missile capable of lifting payloads in excess of 1,000 lbs. into orbit."

Present indications are that early versions of the segmented solid booster will be limited to 115-inch diameters, to ease transportation to launch sites along highway and rail routes where maximum clearances are limited to 13 feet.

Lt. Gen. Bernard A. Schreiever of ARDC has recommended to the House Public Works Committee that a 13-ft. maximum clearance on highways and railroads be increased to 17 ft. Air Force technicians have said they expect an early increase of the capacity of the segmented rocket motor to "three or four times its present thrust" and will build the first one as aiming at a thrust "twice that of the Minuteman first-stage motor."

Designing the booster involves building a special joint, or section

BOUNDARY LAYER BREAKTHROUGH

New BLC-130 takes off or lands in five times its own length

coupler, which will allow motor assembly in building-block fashion and allow functioning of guidance and motor controls no matter how many sections are included in the unit.

While the sectional motor has no advantage from aerodynamic standpoint, its sectional design is strictly for ease in transport and handling. In large rocket boosters, this problem could become critical. However, sectional design will provide the solution and allow flexibility by adding or taking away sections.

Industry Developments

Four Generations Of Aircraft Seen

There will be at least four more generations of military jet aircraft, contrary to the apparent heavy trend to space flight, according to Dr. Alexander Kartveli, of Republic Aviation Corp.

Speaking to the Institute of Aeronautical Sciences, Kartveli called the Mach 25 man-carrying vehicle the "ultimate" airplane. But besides this, the designer cited the following future aircraft types as possibilities:

(1) A VTOL fighter-bomber, operating from 75,000 ft. to sea level, and flying at Mach 2.3.

(2) A Mach 4-plus nuclear ramjet strategic bomber, with a range up to 8,500 miles.

(3) A Mach 7 bomber, with range to 5,000 miles, powered by two ramjet and two turbojet engines.

(4) Finally, and bordering on space flight, would be a "lifting machine with chemical air breathing powerplant, carying heavy loads, and operating as an orbital bomber, in the same line as the Dyna-Soar project now under study.

New Computer Center Gives Numerical Control

A new computer center specializing in numerical control service for all industries has been announced by the Wichita Div. of Boeing Airplane Co.

All business and manufacturing concerns, regardless of size, or dollar volume involved would be potential customers, according to Boeing.

The new system provides services on all phases of numerical control, but primarily in machine programming parts, tools, dies and templates and complete preparation of tapes for numerically controlled machine tools.

Benefits of such work would include reduced costs, faster production, fewer parts rejections and smaller inventories.

Magnetic Tape Aids Weather Work

Fast magnetic-tape units and an all-transistorized digital computer are being used by the Navy to provide faster, more accurate weather information to it operating units.

The technique is under the newly-established Navy Numerical Weather Problems Group (NANWEP).

Aim is to devise new and better ways to get information on weather and oceanographic forecasting for subsurface, surface and air operations, sea, ice and amphibious problems, providing least-time routes for ships and aircraft, and finding sea and atmospheric effects on electro-magnetic wave propagation and sonar performance.

By using Ampex magnetic tape, the Navy office is able to process and analyze reports from over 5,000 weather stations on a much faster basis than would otherwise be possible.

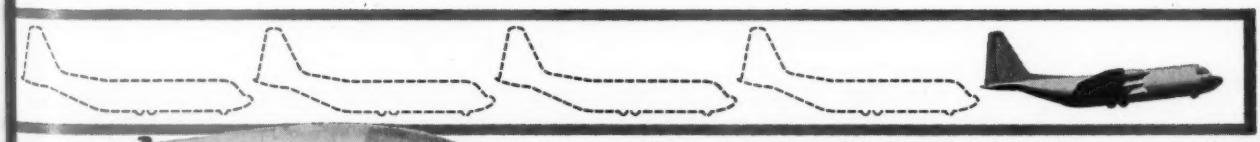
magine a 50-ton Hercules airfreighter lifting off in just 500 feet, om a standing start on an unprepared field. Or picture the big rop-jet stopping after touchdown in 520 feet. This performance f Lockheed's Boundary Layer Control C-130, at mid-point of a 000-mile round trip mission, is truly remarkable. But its signifiance goes far beyond the spectacle itself.

he BLC-130 brings true STOL capability to Air Force support issions. Whether it has to rush 92 combat troops to a spreading rush-fire fight, or airlift 18 tons of food to some remote hunger spot, the huge airlifter will be able to deliver its payload closer to the action than ever before possible.

A test bed BLC-130 has completed advanced flight tests, clearly illustrating the feasibility of boundary layer control on big planes.

LOCKHEED

GEORGIA DIVISION MARIETTA, GEORGIA



High speed air—supplied from pylon-mounted turbojet compressors and blown over flaps, ailerons, elevator, and rudder—causes the airstream to hug the surfaces instead of being separated from them. The energization of this boundary layer of air gives the BLC-130 its extraordinarily high lift.

Procurement Trends

ONE OF NATO'S MAJOR SUPPLY HEADACHES MAY BE EASED in the fairly near future. The problem: lack of common supply language, with all the resulting problems. The solution: A number of the NATO nations (Holland, Canada, Germany, Norway) are adopting the U. S. Federal cataloging system. These stock numbers, when fed into the NATO system, will provide precisely the common language lacking in the past.

PROBE INTO ELECTRONICS/ELECTRICAL MATERIAL AREA currently underway at Armed Forces Supply Support Center, due to be wrapped up by year-end. While the Center is not committed to a single manager decision, it seems like one of the more likely results at this point.

AIR FORCE RELUCTANCE ON ACCEPTING SINGLE MANAGERSHIP is fast becoming a thing of the past. As the only service that has no commodity single manager responsibilities, AF is long overdue for such an assignment. From generally recognized hesitancy in the past, AF has become a "great petitioner" for a commodity managership.

RUMOR AND COUNTER-RUMOR ON ADVERTISING ALLOWABILITY for Defense contractors adds up to precisely nothing at this point. Best way to get an accurate score is to look in the ASPR—where the same rule stands that has stood in the past. Study along these lines by OSD/S&L has hit enough unanswerables to put any outcome several months away.

BRIGHT SPOT IN THE CLOUDY-TO-DARK COMPUTER BUSINESS is the IBM 705 used by the Armed Forces Supply Support Center. Use rate on the machine is well over 95%, almost unheard-of even in an established ADP operation.

MAJOR SHAKEUP OF INFORMATION AND INDUSTRIAL SECURITY—spearheaded by the Defense Public Affairs shop—seems generally to offer a saner approach to an oft-berated program. Most recent move of three was declassification of documents from World War II Office of Scientific Research and Development.

IN THE INDUSTRIAL PERSONNEL CLEARANCE AREA, Defense Directive 5220.6 clears up former loopholes discovered in the Supreme Court Greene v. McElroy case. The new directive (1) extends industrial security measures to cover other executive agencies, and (2) provides for hearings to be held in the presence of the applicant.

SPECIFICATION STANDARDIZING ENGINEERING DRAWINGS developed a year ago by Armed Forces Supply Support Center is undergoing a thorough overhaul and rewrite. Aim is to read into the document (Mil-D-70327) a full year's experience, iron out the bugs. Idea behind the original was "do it and see what happens." The new document will be basically the same as the original, with re-write emphasis on clearer, more standard interpretation.

AIR FORCE HAS PICKED UP NAVY'S *PERT* IDEA with a will, may use it in connection with timing work on its own missiles, as Navy did with Polaris. One possibility for the future: some sources feel PERT (Program Evaluation & Review Technique) could be used in predicting and controlling reliability in the same way it has for time factors.

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Navy Closes Down Norfolk Computer

After nearly six months of frustration, the Navy has turned thumbs down on the electronic data processing system which was to mechanize stock point operations at the Norfolk Naval Supply Center.

Reason for cancellation of the program—which hinged around a Burroughs 220—was a "consistent pattern of machine failure." Said one Navy source, "it didn't come up to the speed planned, and it was pretty apparent that there would be no pay off."

Basically, the Burroughs machine did not measure up to its expectations. Biggest problem was the machine's inability to provide rapid random access, a necessary characteristic in the type of work that is done in Norfolk.

Navy had expected a certain document rate when it started the program but the machine never produced more than one-fourth of that rate. Navy sources felt that with adjustment it might have come up to one-half or three-fifths of the desired rate but would never have made it all the way.

Navy explains that when the computer was chosen, in 1958, it was the machine "with the most potential at the lowest price." But, Navy sources point out a "certain amount of faith, a certain amount of risk," is involved with such a long lead time project. Best estimate is that Navy invested "several hundred thousand dollars" in the program.

Navy still definitely plans to return to an EDP-type operation, but in the interim will use clerks and tub files to provide random access, and electronic accounting machines to process the material so selected.

New Cargo System Speeds Navy Supply Deliveries

A new ocean cargo documentation system developed by Navy to speed cargo delivery at reduced labor costs has been introduced at Naval Supply Center, Norfolk, Va.

Announced by Bureau of Supplies and Accounts, the new system features streamlined cargo handling and paper work procedure at loading ports.

Aim is to ease ship stowage and discharge, and the new Navy Cargo Document (NAVSANDA Form 1121) will replace the Navy Conveyance Bill of Lading and Continuation Sheets, the Ocean Manifest, Hatch List and various local forms used as pile tags.

Under the new operation, Navy discharge activities will use the cargo document to determine dockside space and location needs for accumulating cargo, to serve as a hatch list and discharge time table, as a quantity and condition checklist and as a receipt document for delivery to final consignee.

Besides quickening delivery tempo, the system sharply cuts paper work presently required in ocean cargo documentation.

Bright Future Seen For Army Aviation

Larger numbers of Army aircraft—with an increasingly important role in combat operations—were predicted at the recent meeting of the Association of the U.S. Army in Washington.

According to Col. G. T. Metcalf, chief of the plans division of CONARC's combat development section, the present 40-50 aircraft in the com-

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bat division would be increased to "more than 100" in the next five years. Approval for this expansion, he said, should come within several months.

Speaking to the same group, Brig. Gen. C. F. von Kann, Director of Army Aviation, said Army aviation could "no longer be luxury" but should become a basic means of maneuver and movement.

Stressing the need for air mobility, von Kann also pointed to the need to develop complete helicopter weapon systems, along the lines of mating helicopters and missiles.

New Maintenance Policy Set Forth in Directive

Basic ground rules for maintenance work on military equipment by the military and which should be done through commercial contract are set forth in a new Defense Directive.

Setting forth such ground rules for the first time, the directive, in effect, asks "what must we keep in-house."

Working from a mission priority standpoint, each service must designate those items that are mission-essential and set forth the extent of military resources needed to maintain them.

The new directive is reportedly based on two premises: that it is in the best interest of national security that the military departments be able to maintain their mission essential weapons and equipment, and that the national economy is best served in supporting free enterprise by using commercial sources whenever practicable.

Defense sources seemed doubtful that the new directive would make any great difference in the amount of work being done by contractors. But sources also noted the directive could eventually change this mix as the services concentrate on prime mission hardware at the expense of secondary maintenance work.

Value Engineering Set for AF Missiles

Air Force has kicked off an "aggressive" value engineering program in connection with quality and reliability needs of its ballistic missile program. According to Brig. Gen. Don Coupland, Deputy Command, Ballistic Missiles Center, the Air Force is "after the optimum and quality and reliability, at a price within our budget.

"With this in mind," Coupland said, "we have introduced an aggressive value engineering program at both prime and subcontractor level."

Navy's Bureau of Ships has served as a leader in military application of value engineering. Aim of such a program is to get highest possible value for each dollar spent.

Specifically, Coupland said Air Force wants "elimination of gold plating, simplification of design, increased reliability, the use of materials of lower cost whenever and wherever possible, standardization of parts, and the adaption of faster and most economical processing methods."

Columbus, O. Named As New Supply Agency

The new Military Construction Supply Agency will be located at Columbus, Ohio, Army has announced.

The agency will act for Secretary of the Army as a Single Manager of Military Construction Supply. Work will be done under jurisdiction of Army Chief of Engineers.

To handle procurement, storage, distribution and other wholesale supply management responsibilities, the agency will handle such building materials and equipment as lumber, plumbing and heating supplies, pre-fabricated and portable buildings, compressors, pumps, and repair parts for construction machinery.

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The Seventh Of Fourteen Erroneous Postulates

7—Leadership (management) is getting things done through people

by Leland B. Kuhre,
Col., USA (Ret.)

Founder and Director
The Academy of Organizational Science*

Hardly a month goes by without this in civilian or military print: "Management (leadership) is getting things done through people." Repetition and prestige-utterance implant the generalization in mind with the weight of a postulate—a starting assumption from which to derive practice. Its *idea* (using other people) is as old as man himself; its method has changed to indirect *getting* from direct *making* (people do things).

Throughout the ages, the idea in the postulate was in harmony with assumed laws of nature, physical common sense, and inferences about the nature of man; it pervaded public government and private government of collective human effort. The idea's modern word *manage* came into English in the 16th century with this still-prevailing meaning: to cause persons, animals, instruments, affairs, etc. to submit to one's control and *make* them serve one's purpose.

In the 16th, 17th, and 18th centuries, *make* was still valid; it was natural that persons were born submissive in a managed delegated-authority hierarchy for all facets of their lives—political, religious, social, bread-winning; they accepted their born places as their fixed-for-life natural inheritance.

But sparked-by-Newton-18th-century Reason repealed old assumed laws of nature, established a common sense of reason, and perceived the true nature of generic man. In 1776, the Declaration of Independence postulated for *all* men: born equal, not into a hierarchy; inherent reason, not some with it and others without it; an inalienable right to govern themselves, but not others.

This new natural man made the old managed hierarchy untenable. For free people, the Constitution provided the contract; superior-inferior contractual relations for getting things done do not impose superior-inferior personal relations.

However, the now-erroneous *make* idea continued as long as it could in the face of rising education coupled with a (since 1827) definite trade union movement. In the last few decades, management has been forced to change from directly making a *person* do things to indirectly managing (leading) his *personality* so that *it* will make the person do things.

But substituting *personality* for *person* in "persons, animals, instruments, affairs, etc." does not validate; on the contrary, it compounds the error by invading, openly or stealthily, man's private property—his personality.

As with any postulate, the idea in the one under discussion permeates practice. Persons sense it in the atmosphere, and they resent it in proportion to their awareness of their 1776 entitlement—to be free; from hierarchy, from bread-winning-necessity submission to personality management, and from being used to serve the purpose of another. This resentment, usually unverbalized and necessarily hidden, wastes time and energy: it clouds and diverts thought; and, periodically, it swells into discord, conflict, or revolt. Any waste of time and energy is inefficiency.

Thus, the postulate is erroneous.

Valid postulates contain these concepts: Reason frames the organization's intended continuing accomplishment as its contract for its planned life so that, from it, reason can create by generation, concurrently, the needed individual contracts and the system of contractual relations connecting them. The contracts—leader, executive, administrative, professional, scientific, technical, clerical, artisan, common skill—call for expected contributions (mental and physical) to the collective accomplishment. Reason manages the system of contracts while *letting* responsive-to-their-contracts people get things done; and the system integrates their contributions to form the whole intended accomplishment. Managing a system of contractual relations as primary is easier, costs less, and is more effective than is *trying* to manage a web of personal relations as primary for the same accomplishment.

The erroneous postulate as worded is made valid by replacing "through people" with "through contracts."

*Author Kuhre can be contacted at P. O. Box 5274, San Antonio 1, Texas.

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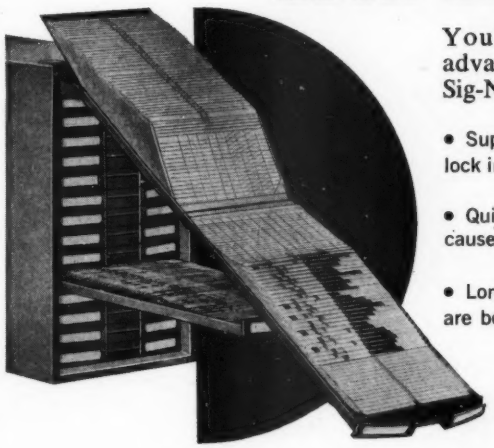

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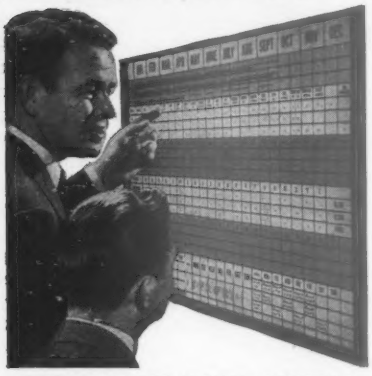

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AMERICA'S INVESTMENT-CONSCIOUS JOINERS

The most puzzling aspect of America's booming investment club movement whose 350,000 participants include oil riggers, housewives, doctors, policemen, lawyers, servicemen, airline pilots, musicians and farmers is the curious fact that nobody knows exactly how it began.

Apparently the concept of friends, neighbors and business associates regularly pooling small sums to invest together reaches back into the late 19th century. Depending on who's talking, investment clubs originated in Pittsburgh in the 1880's, in Toledo, Ohio at about the same time, or in upstate New York even earlier.

One of the most popular theories, especially along the Mississippi river basin, credits a group of Iowans with first organizing an investment club late in 1885 in either Davenport or Dubuque. According to this particular version, the club bought shares of railroad stock.

Yet the first known case of an American investment club stems not from Iowa, New York, Ohio or Pennsylvania but from the cheery little town of Corsicana, Tex., where a banker name of A. L. Brooks and some friends began investing $5 apiece every month in 1898—when $5 really amounted to something. Not long ago Brooks himself recalled that he had accumulated his first $1,000 through that club.

Whatever the exact origins may have been, not much happened with investment clubs for a long time. On a word-of-mouth basis, small clusters of clubs developed, many of them in New York, St. Louis, and around Detroit, yet nothing substantial enough to start any bells ringing.

Then in the autumn of 1940 twelve young men attending Wayne University in Detroit organized the Mutual Investment Club. With the help of a Stock Exchange broker they pitched in $10 a month apiece, voted on which stocks to buy with accumulated club funds, acquired shares of steels, oils, automotives, even rubbers and airlines.

"As ambitious young blokes given to looking ahead some, we agreed to concentrate mostly on growth stocks," says Lewis Rockwell, a prominent Detroit attorney who was one of those originals. "Over the years it looks as if we've done pretty well, doesn't it?"

Indeed it does. Mutual has spun total club contributions of $40,000 up to $151,515 worth of securities, and they're still growing. While some of these stocks have tailed off in value, most of them have gone up, up, up.

Under the circumstances, it wasn't surprising that the Detroit Free Press got hold of the story of the Mutual Investment Club. Written as a local feature, that story gave the novel success of Mutual considerable renown in and around Detroit.

Before the ink even faded, members of Mutual found themselves in some demand. From the arc around Detroit, other parts of the Midwest and even areas as distant as Memphis and Denver came visits, phone calls and mail. Some of it came from people who had similar clubs themselves; the great majority was from men, women and even teen-age students asking, please, how they could form their own investment clubs.

Despite the staggering volume of calls and correspondence, the Mutual Investors sent detailed answers to everyone. At about the same time many Member Firm offices of the New York Stock Exchange, which looked kindly on the club movement as a sound way for people to learn about investing with a minimum of risk, began advising Americans how to organize and run clubs on a sound basis. Out of that evolved the current boom.

And if anyone were to ask why the burgeoning investment club movement hasn't become global, well, it has. Early in July clubbers from the United States, England, France, Holland, West Germany, Italy, New Zealand, Japan and Australia assembled in London and formed an international federation.

In other words, investment clubs seem to have reached a rousing majority without ever locating those anonymous founding fathers who first started the trend.

Cost Improvement . . .

(continued from page 35)

able proposals are the ground rules under which we operate. These standards must be met: (1) There must be change in a previously accepted cost. (2) A deliberate effort must be involved. (3) Measurable savings must be produced. And (4) The proposal must be in effect during the current calendar year.

On the first of these, the aim is to avoid improvements which are part of the job to begin with. A change must take place. It rules out such "improvements" as those which occur through normal review channels. If an original plan is accepted and approved, a subsequent change may be a good cost improvement, according to our definition.

Deliberate initiator effort may be either originating an idea or implementing it or both. Split credit goes along with split efforts.

Savings measurements are self-explanatory.

Credit is not given for ideas not in effect. C.I. is not a suggestion system and all such proposals are rejected, usually with recommendations on what should be done to put them in effect.

Administratively, the program is run by the Manager, Operations Analysis, two full-time specialists and clerical help. Final decisions are made by a review board.

These boards consist of managers or high level specialists, who review in each of their areas (Engineering, Hardware and Administration) possible C.I. work.

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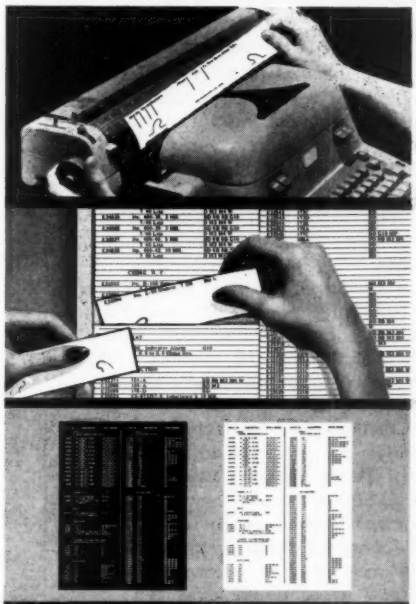

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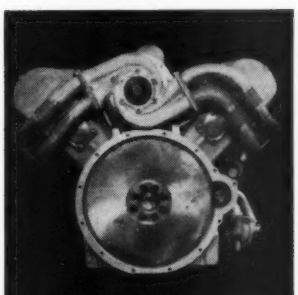

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